

**Project Report  
ATC-240**

**Lincoln Laboratory Evaluation of  
TCAS II Logic Version 6.04a – Appendices  
Volume II**



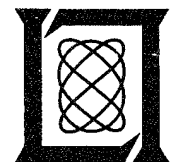
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**15 February 1996**

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16. Abstract  This report documents the Lincoln Laboratory evaluation of the Traffic Alert and Collision Avoidance System II (TCAS II) logic version 6.04a. TCAS II is an airborne collision avoidance system required since 30 December 1993 by the FAA on all air carrier aircraft with more than 30 passenger seats operating in U.S. airspace. Version 6.04a is a logic version mandated by the FAA by 30 December 1994 in order to correct a potential safety problem in earlier versions and to make the TCAS logic more compatible with the air traffic control system.  Lincoln Laboratory evaluated the logic by examining approximately two million simulated pairwise TCAS-TCAS encounters, derived from actual aircraft tracks recorded in U.S. airspace. The main goals of the evaluation effort were: (1) to determine if version 6.04a successfully corrected the potential safety problem without introducing new problems; (2) to detect and explain any areas of poor performance; and (3) to understand the performance limits of the logic. Five analysis programs were written to aid in the evaluation, and these programs are described in the report.  There were three phases of the evaluation corresponding to the above three goals. For each phase, the report gives an overview of the evaluation approach taken, a description of the results, and a summary. A description of follow-on activities plus overall conclusions and recommendations are given at the end of the report.			
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# APPENDIX A

## SCENARIO DEFINITION FOR TCAS II TESTING

<u>CLASS</u>	<u>PARAMETER VARIED</u>	<u>RANGE</u>	<u>STEP SIZE</u>	<u>MULTIPLICATION FACTOR</u>
0,10	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-400, 400 fpm	400	3
	vertical rate 2	0, 400 fpm	400	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2
				<hr/> 84 * 26 = 2184
1,11	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-400, 400 fpm	400	3
	vertical rate 2	1000, 5000 fpm	2000	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2
				<hr/> 252 * 26 = 6552
2,12	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-400, 400 fpm	400	3
	vertical rate 2	1000, 5000 fpm	2000	3
	vertical accel 2	.05, .35 g	.1	4
	time vert accel 2	20, 30 sec	5	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2
				<hr/> 3024 * 26 = 78624
3,13	alt sep @ CPA	-1000, 1000 ft	250	9
	vertical rate 1	-400, 400 fpm	400	3
	vertical rate 2	1000, 5000 fpm	2000	3
	vertical accel 2	-.35, -.05 g	.1	4
	time vert accel 2	20, 30 sec	5	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2
				<hr/> 3888 * 26 = 101088
4,14	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-5000, 5000 fpm	2000	6
	vertical rate 2	1000, 5000 fpm	2000	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2
				<hr/> 504 * 26 = 13104

5,15	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-5000, 5000 fpm	2000	6
	vertical rate 2	1000, 5000 fpm	2000	3
	vertical accel 2	.05, .35 g	.1	4
	time vert accel 2	20, 30 sec	5	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2

---

6048 \* 26 = 157248

6,16	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-5000, 5000 fpm	2000	6
	vertical rate 2	-5000, -1000 fpm	2000	3
	vertical accel 2	.05, .35 g	.1	4
	time vert accel 2	20, 30 sec	5	3
	alt bins	-20, 20 ft	40	2
	alt a/c 1 at CPA	3700,7500 ft	3800	2

---

6048 \* 26 = 157248

7,17	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	1000, 5000 fpm	2000	3
	vertical rate 2	-5000, 5000 fpm	2000	6
	vertical accel 1	.05, .25 g	.1	3
	vertical accel 2	magnitudes .05	.1	4
		to .35 g; sign		
		is same sign of		
		vertical rate		
	time vert accel 1	25 sec		1
	time vert accel 2	20, 30 sec	5	3
	alt a/c 1 at CPA	3700,7500 ft	3800	2

---

9072 \* 26 = 235872

8,18	alt sep @ CPA	-750, 750 ft	250	7
	vertical rate 1	-5000, -1000 fpm	2000	3
	vertical rate 2	-5000, 5000 fpm	2000	6
	vertical accel 1	.05, .25 g	.1	3
	vertical accel 2	magnitudes .05	.1	4
		to .35 g; sign		
		is same sign of		
		vertical rate		
	time vert accel 1	25 sec		1
	time vert accel 2	20, 30 sec	5	3
	alt a/c 1 at CPA	3700,7500 ft	3800	2

---

9072 \* 26 = 235872

9,19	alt sep @ CPA	-1000, 1000 ft	250	9
	vertical rate 1	1000, 5000 fpm	2000	3
	vertical rate 2	-5000, 5000 fpm	2000	6
	vertical accel 1	-.15, -.05	.1	2
	vertical accel 2	magnitudes .05	.1	4
		to .35 g; sign		
		is opposite sign of		
		vertical rate		
	time vert accel 1	25 sec		1
	time vert accel 2	20, 30 sec	5	3
	alt a/c 1 at CPA	3700,7500 ft	3800.	2

7776 \* 26 = 202176

TOTAL SCENARIOS RUN :

CLASS 0,10	2,184
CLASS 1,11	6,552
CLASS 2,12	78,624
CLASS 3,13	101,088
CLASS 4,14	13,104
CLASS 5,15	157,248
CLASS 6,16	157,248
CLASS 7,17	235,872
CLASS 8,18	235,872
CLASS 9,19	202,176
-----	
TOTAL	1,189,968

## APPENDIX B

### TOTAL OF ENCOUNTERS RUN; BREAKDOWN BY ENCOUNTER CLASS AND EQUIPAGE

Class	Number of Parameters Variations*	Dataset 1 (26 equip. pairs)	Dataset 2 (30 equip. pairs)	Dataset 3 (30 equip. pairs)
0/10	84	2184	2520	2520
1/11	252	6552	7560	7560
2/12	3024	78624	90720	90720
3/13	3888	101088	116640	116640
4/14	504	13104	15120	15120
5/15	6048	157248	181440	181440
6/16	6048	157248	181440	181440
7/17	9072	235872	272160	272160
8/18	9072	235872	272160	272160
9/19	7776	202176	233280	233280
Total		1,189,968	1,373,040	1,373,040

\* from "multiplication factor" in Appendix A

#### Dataset 1 - 26 equipage pairs

#### 6.02, 6.04, 6.04a

#### Pilot Responding

<u>AC1</u>	<u>AC2</u>	<u>AC1</u>	<u>AC2</u>
1. Mode C vs. non-resp TCAS (planned)		14. non-resp TCAS vs. Mode C (planned)	
2. Mode C vs. 6.02		15. 6.02 vs. Mode C	
3. Mode C vs. 6.04		16. 6.04 vs. Mode C	
4. Mode C vs. 6.04a		17. 6.04a vs. Mode C	
5. 6.02 low ID vs. 6.02 high ID		18. 6.02 high ID vs. 6.02 low ID	
6. 6.02 low ID vs. 6.04 high ID		19. 6.04 high ID vs. 6.02 low ID	
7. 6.02 high ID vs. 6.04 low ID		20. 6.04 low ID vs. 6.02 high ID	
8. 6.02 low ID vs. 6.04a high ID		21. 6.04a high ID vs. 6.02 low ID	
9. 6.02 high ID vs. 6.04a low ID		22. 6.04a low ID vs. 6.02 high ID	
10. 6.04 low ID vs. 6.04 high ID		23. 6.04 high ID vs. 6.04 low ID	
11. 6.04 low ID vs. 6.04a high ID		24. 6.04a high ID vs. 6.04 low ID	
12. 6.04 high ID vs. 6.04a low ID		25. 6.04a low ID vs. 6.04 high ID	
13. 6.04a low ID vs. 6.04a high ID		26. 6.04a high ID vs. 6.04a low ID	

**Dataset 2 - 30 equipage pairs**

**6.02, 6.04a**

**Pilot Responding and Pilot Non-responding (PNR)**

- | <u>AC1</u>                             | <u>AC2</u> | <u>AC1</u>                             | <u>AC2</u> |
|----------------------------------------|------------|----------------------------------------|------------|
| 1. Mode C vs. non-resp TCAS (planned)  |            | 16. non-resp TCAS vs. Mode C (planned) |            |
| 2. Mode C vs. 6.02                     |            | 17. 6.02 vs. Mode C                    |            |
| 3. Mode C vs. 6.04a                    |            | 18. 6.04a vs. Mode C                   |            |
| 4. 6.02 low ID vs. 6.02 high ID        |            | 19. 6.02 high ID vs. 6.02 low ID       |            |
| 5. 6.02 low ID vs. 6.04a high ID       |            | 20. 6.04a high ID vs. 6.02 low ID      |            |
| 6. 6.02 high ID vs. 6.04a low ID       |            | 21. 6.04a low ID vs. 6.02 high ID      |            |
| 7. 6.02 low ID vs. 6.02 PNR high ID    |            | 22. 6.02 PNR high ID vs. 6.02 low ID   |            |
| 8. 6.02 high ID vs. 6.02 PNR low ID    |            | 23. 6.02 PNR low ID vs. 6.02 high ID   |            |
| 9. 6.02 low ID vs. 6.04a PNR high ID   |            | 24. 6.04a PNR high ID vs. 6.02 low ID  |            |
| 10. 6.02 high ID vs. 6.04a PNR low ID  |            | 25. 6.04a PNR low ID vs. 6.02 high ID  |            |
| 11. 6.04a low ID vs. 6.04a high ID     |            | 26. 6.04a high ID vs. 6.04a low ID     |            |
| 12. 6.04a low ID vs. 6.02 PNR high ID  |            | 27. 6.02 PNR high ID vs. 6.04a low ID  |            |
| 13. 6.04a high ID vs. 6.02 PNR low ID  |            | 28. 6.02 PNR low ID vs. 6.04a high ID  |            |
| 14. 6.04a low ID vs. 6.04a PNR high ID |            | 29. 6.04a PNR high ID vs. 6.04a low ID |            |
| 15. 6.04a high ID vs. 6.04a PNR low ID |            | 30. 6.04a PNR low ID vs. 6.04a high ID |            |

**Dataset 3 - 30 equipage pairs**

**6.04, 6.04a**

**Pilot Responding and Pilot Non-responding (PNR)**

- | <u>AC1</u>                             | <u>AC2</u> | <u>AC1</u>                             | <u>AC2</u> |
|----------------------------------------|------------|----------------------------------------|------------|
| 1. Mode C vs. non-resp TCAS (planned)  |            | 16. non-resp TCAS vs. Mode C (planned) |            |
| 2. Mode C vs. 6.04                     |            | 17. 6.04 vs. Mode C                    |            |
| 3. Mode C vs. 6.04a                    |            | 18. 6.04a vs. Mode C                   |            |
| 4. 6.04 low ID vs. 6.04 high ID        |            | 19. 6.04 high ID vs. 6.04 low ID       |            |
| 5. 6.04 low ID vs. 6.04a high ID       |            | 20. 6.04a high ID vs. 6.04 low ID      |            |
| 6. 6.04 high ID vs. 6.04a low ID       |            | 21. 6.04a low ID vs. 6.04 high ID      |            |
| 7. 6.04 low ID vs. 6.04 PNR high ID    |            | 22. 6.04 PNR high ID vs. 6.04 low ID   |            |
| 8. 6.04 high ID vs. 6.04 PNR low ID    |            | 23. 6.04 PNR low ID vs. 6.04 high ID   |            |
| 9. 6.04 low ID vs. 6.04a PNR high ID   |            | 24. 6.04a PNR high ID vs. 6.04 low ID  |            |
| 10. 6.04 high ID vs. 6.04a PNR low ID  |            | 25. 6.04a PNR low ID vs. 6.04 high ID  |            |
| 11. 6.04a low ID vs. 6.04a high ID     |            | 26. 6.04a high ID vs. 6.04a low ID     |            |
| 12. 6.04a low ID vs. 6.04 PNR high ID  |            | 27. 6.04 PNR high ID vs. 6.04a low ID  |            |
| 13. 6.04a high ID vs. 6.04 PNR low ID  |            | 28. 6.04 PNR low ID vs. 6.04a high ID  |            |
| 14. 6.04a low ID vs. 6.04a PNR high ID |            | 29. 6.04a PNR high ID vs. 6.04a low ID |            |
| 15. 6.04a high ID vs. 6.04a PNR low ID |            | 30. 6.04a PNR low ID vs. 6.04a high ID |            |

# APPENDIX C

## NMAC TABLES

MITRE encounter class: 0 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 0.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 8  
 Normalizing number for TCAS-TCAS cells: 16

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	—	0	0	0	—	
i	6.02	0	0	0	0	—	
r	6.04	0	0	0	0	—	
c	6.05	0	0	0	0	—	
r							
a							
f							
t							
l		—	—	—	—	—	

Table 0.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 8  
 Normalizing number for TCAS-TCAS cells: 16

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	—	0	0	0	—	
i	6.02	0	0	0	0	—	
r	6.04	0	0	0	0	—	
c	6.05	0	0	0	0	—	
r							
a							
f							
t							
l		—	—	—	—	—	

MITRE encounter class: 0 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 0.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 8  
 Normalizing number for TCAS-TCAS cells: 16

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	



MITRE encounter class: 0 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 0.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 10  
 Normalizing number for TCAS-TCAS cells: 20

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

Table 0.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 10  
 Normalizing number for TCAS-TCAS cells: 20

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	10	10	10	—	
r							
c	6.02	10	20	20	20	—	
r							
a	6.04	10	20	20	20	—	
f							
t	6.05	10	20	20	20	—	
l		—	—	—	—	—	

Table 10.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 4  
 Normalizing number for TCAS-TCAS cells: 8

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

Table 10.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 4  
 Normalizing number for TCAS-TCAS cells: 8

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

MITRE encounter class: 10 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 10.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 4  
 Normalizing number for TCAS-TCAS cells: 8

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	—	0	0	0	—	
	6.02	0	0	0	0	—	
	6.04	0	0	0	0	—	
	6.05	0	0	0	0	—	
	1	—	—	—	—	—	

Table 10.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 62  
 Normalizing number for TCAS-TCAS cells: 124

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

Table 10.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 62  
 Normalizing number for TCAS-TCAS cells: 124

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	57	38	38	—	
r							
c	6.02	55	118	110	110	—	
r							
a	6.04	38	114	76	76	—	
f							
t	6.05	38	114	76	76	—	
l		—	—	—	—	—	

MITRE encounter class: 1 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 1.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 36  
 Normalizing number for TCAS-TCAS cells: 72

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

Table 1.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 36  
 Normalizing number for TCAS-TCAS cells: 72

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

MITRE encounter class: 1 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 1.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 36  
 Normalizing number for TCAS-TCAS cells: 72

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	0	0	--	
i	6.02	0	0	0	0	--	
r	6.04	0	0	0	0	--	
c	6.05	0	0	0	0	--	
r							
a							
f							
t							
l		--	--	--	--	--	

MITRE encounter class: 1 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 1.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 152  
 Normalizing number for TCAS-TCAS cells: 304

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	0	--		
r								
c	6.02	0	0	0	0	--		
r								
a	6.04	0	0	0	0	--		
f								
t	6.05	0	0	0	0	--		
l		--	--	--	--	--		

Table 1.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 152  
 Normalizing number for TCAS-TCAS cells: 304

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	152	145	145	--		
r								
c	6.02	152	304	304	304	--		
r								
a	6.04	145	304	290	290	--		
f								
t	6.05	145	304	290	290	--		
l		--	--	--	--	--		

Table 11.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

Table 11.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	



MITRE encounter class: 11 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 11.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	0	--		
r								
c	6.02	0	0	0	0	--		
r								
a	6.04	0	0	0	0	--		
f								
t	6.05	0	0	0	0	--		
1		--	--	--	--	--		

MITRE encounter class: 11 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 11.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 64  
 Normalizing number for TCAS-TCAS cells: 128

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

Table 11.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 64  
 Normalizing number for TCAS-TCAS cells: 128

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	64	38	38	—	
r							
c	6.02	64	128	128	128	—	
r							
a	6.04	38	128	76	76	—	
f							
t	6.05	38	128	76	76	—	
1		—	—	—	—	—	

MITRE encounter class: 2 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 2.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 432  
 Normalizing number for TCAS-TCAS cells: 864

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
l		—	—	—	—	—	

Table 2.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 432  
 Normalizing number for TCAS-TCAS cells: 864

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	2	0	0	0	—	
r							
a	6.04	14	2	5	5	—	
f							
t	6.05	14	2	5	5	—	
l		—	—	—	—	—	

MITRE encounter class: 2 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 2.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 432  
 Normalizing number for TCAS-TCAS cells: 864

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	—	0	0	0	—	
i							
r	6.02	2	0	0	0	—	
c							
r	6.04	14	2	5	5	—	
a							
f	6.05	14	2	5	5	—	
t							
1		—	—	—	—	—	

MITRE encounter class: 2 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 2.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1516  
 Normalizing number for TCAS-TCAS cells: 3032

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	56	63	63	—	
r							
c	6.02	206	12	16	16	—	
r							
a	6.04	170	20	52	52	—	
f							
t	6.05	170	20	52	52	—	
l							
1		—	—	—	—	—	

Table 2.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1516  
 Normalizing number for TCAS-TCAS cells: 3032

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	1460	1439	1439	—	
r							
c	6.02	1310	3020	3016	3016	—	
r							
a	6.04	1338	3012	2970	2970	—	
f							
t	6.05	1338	3012	2970	2970	—	
l							
1		—	—	—	—	—	

MITRE encounter class: 12 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 12.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

Table 12.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

MITRE encounter class: 12 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 12.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	0	--		
r								
c	6.02	0	0	0	0	--		
r								
a	6.04	0	0	0	0	--		
f								
t	6.05	0	0	0	0	--		
l		--	--	--	--	--		

MITRE encounter class: 12 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 12.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1076  
 Normalizing number for TCAS-TCAS cells: 2152

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	—	0	0	0	—		
r	6.02	10	0	0	0	—		
c	6.04	13	0	1	1	—		
r	6.05	13	0	1	1	—		
a								
f								
t								
1		—	—	—	—	—		

Table 12.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1076  
 Normalizing number for TCAS-TCAS cells: 2152

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	—	1076	768	768	—		
r	6.02	1066	2152	2152	2152	—		
c	6.04	803	2152	1643	1643	—		
r	6.05	803	2152	1643	1643	—		
a								
f								
t								
1		—	—	—	—	—		



Table 3.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 368  
 Normalizing number for TCAS-TCAS cells: 736

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	0	0	0	--	
	6.02	0	0	0	0	--	
	6.04	0	0	0	0	--	
	6.05	0	0	0	0	--	
	1	--	--	--	--	--	

Table 3.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 368  
 Normalizing number for TCAS-TCAS cells: 736

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	0	0	0	--	
	6.02	17	0	0	0	--	
	6.04	33	0	0	0	--	
	6.05	33	0	0	0	--	
	1	--	--	--	--	--	

MITRE encounter class: 3 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 3.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 368  
 Normalizing number for TCAS-TCAS cells: 736

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	17	0	0	0	—	
r							
a	6.04	33	0	0	0	—	
f							
t	6.05	33	0	0	0	—	
l							
1		—	—	—	—	—	

MITRE encounter class: 3 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 3.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1208  
 Normalizing number for TCAS-TCAS cells: 2416

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

Table 3.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1208  
 Normalizing number for TCAS-TCAS cells: 2416

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	966	748	748	—	
r							
c	6.02	934	1940	1868	1868	—	
r							
a	6.04	746	1932	1496	1496	—	
f							
t	6.05	746	1932	1496	1496	—	
1		—	—	—	—	—	

MITRE encounter class: 13 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 13.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 64  
 Normalizing number for TCAS-TCAS cells: 128

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	0	0	0	0	—	
r							
a	6.04	0	0	0	0	—	
f							
t	6.05	0	0	0	0	—	
1		—	—	—	—	—	

Table 13.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 64  
 Normalizing number for TCAS-TCAS cells: 128

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	0	0	—	
r							
c	6.02	1	0	0	0	—	
r							
a	6.04	1	0	0	0	—	
f							
t	6.05	1	0	0	0	—	
1		—	—	—	—	—	

MITRE encounter class: 13 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 13.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an

NMAC, based on simulation truth): 64

Normalizing number for TCAS-TCAS cells: 128

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A	Mode C	—	0	0	0	—		
i	6.02	1	0	0	0	—		
r	6.04	1	0	0	0	—		
c	6.05	1	0	0	0	—		
r								
a								
f								
t								
l		—	—	—	—	—		

MITRE encounter class: 13 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 13.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2248  
 Normalizing number for TCAS-TCAS cells: 4496

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	26	19	--		
r								
c	6.02	8	0	2	0	--		
r								
a	6.04	11	14	21	3	--		
f								
t	6.05	11	8	18	4	--		
l		--	--	--	--	--		

Table 13.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2248  
 Normalizing number for TCAS-TCAS cells: 4496

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	1724	1280	1287	--		
r								
c	6.02	1642	3624	3498	3500	--		
r								
a	6.04	1174	3434	2691	2709	--		
f								
t	6.05	1174	3440	2694	2708	--		
l		--	--	--	--	--		

MITRE encounter class: 4 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 4.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 60  
 Normalizing number for TCAS-TCAS cells: 120

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	0	0	--	
i	6.02	0	0	0	0	--	
r	6.04	0	0	0	0	--	
c	6.05	0	0	0	0	--	
r							
a							
f							
t							
l		--	--	--	--	--	

Table 4.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 60  
 Normalizing number for TCAS-TCAS cells: 120

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	0	0	--	
i	6.02	0	0	0	0	--	
r	6.04	0	0	0	0	--	
c	6.05	0	0	0	0	--	
r							
a							
f							
t							
l		--	--	--	--	--	

MITRE encounter class: 4 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 4.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 60  
 Normalizing number for TCAS-TCAS cells: 120

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	



MITRE encounter class: 4 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 4.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 304  
 Normalizing number for TCAS-TCAS cells: 608

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	1	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	1	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 4.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 304  
 Normalizing number for TCAS-TCAS cells: 608

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	304	293	294	--	
r							
c	6.02	304	608	608	608	--	
r							
a	6.04	293	608	588	588	--	
f							
t	6.05	294	608	588	588	--	
1		--	--	--	--	--	

Table 14.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 12  
 Normalizing number for TCAS-TCAS cells: 24

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 14.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 12  
 Normalizing number for TCAS-TCAS cells: 24

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

MITRE encounter class: 14 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 14.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 12  
 Normalizing number for TCAS-TCAS cells: 24

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

MITRE encounter class: 14 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 14.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 128  
 Normalizing number for TCAS-TCAS cells: 256

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 14.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 128  
 Normalizing number for TCAS-TCAS cells: 256

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	120	84	84	--	
r							
c	6.02	120	256	240	240	--	
r							
a	6.04	84	240	168	168	--	
f							
t	6.05	84	240	168	168	--	
1		--	--	--	--	--	

MITRE encounter class: 5 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 5.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 790  
 Normalizing number for TCAS-TCAS cells: 1580

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	0	--		
r								
c	6.02	0	0	0	0	--		
r								
a	6.04	0	0	0	0	--		
f								
t	6.05	0	0	0	0	--		
l		--	--	--	--	--		

Table 5.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 790  
 Normalizing number for TCAS-TCAS cells: 1580

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	6	--		
r								
c	6.02	69	0	0	0	--		
r								
a	6.04	96	0	0	0	--		
f								
t	6.05	91	0	0	0	--		
l		--	--	--	--	--		

MITRE encounter class: 5 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 5.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 790  
 Normalizing number for TCAS-TCAS cells: 1580

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	0	0	6	--		
r								
c	6.02	69	0	0	0	--		
r								
a	6.04	96	0	0	0	--		
f								
t	6.05	91	0	0	0	--		
1		--	--	--	--	--		

MITRE encounter class: 5 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 5.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 3744  
 Normalizing number for TCAS-TCAS cells: 7488

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	40	107	102	--	
i	6.02	176	4	8	8	--	
r	6.04	165	8	26	26	--	
c	6.05	165	8	26	26	--	
a							
f							
t							
1		--	--	--	--	--	

Table 5.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 3744  
 Normalizing number for TCAS-TCAS cells: 7488

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	3690	3470	3475	--	
i	6.02	3554	7484	7452	7452	--	
r	6.04	3424	7452	7166	7166	--	
c	6.05	3424	7452	7166	7166	--	
a							
f							
t							
1		--	--	--	--	--	

MITRE encounter class: 15 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 15.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 74  
 Normalizing number for TCAS-TCAS cells: 148

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 15.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 74  
 Normalizing number for TCAS-TCAS cells: 148

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	28	0	0	0	--	
r							
a	6.04	26	0	0	0	--	
f							
t	6.05	25	0	0	0	--	
1		--	--	--	--	--	



MITRE encounter class: 15 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 15.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 74  
 Normalizing number for TCAS-TCAS cells: 148

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	28	0	0	0	--	
r							
a	6.04	26	0	0	0	--	
f							
t	6.05	25	0	0	0	--	
1		--	--	--	--	--	

MITRE encounter class: 15 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 15.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1440  
 Normalizing number for TCAS-TCAS cells: 2880

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	8	1	7	--	
r							
c	6.02	8	0	9	7	--	
r							
a	6.04	8	12	28	27	--	
f							
t	6.05	8	4	25	21	--	
1		--	--	--	--	--	

Table 15.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1440  
 Normalizing number for TCAS-TCAS cells: 2880

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	1394	1039	1014	--	
r							
c	6.02	1403	2880	2813	2815	--	
r							
a	6.04	1089	2800	2220	2213	--	
f							
t	6.05	1089	2808	2223	2219	--	
1		--	--	--	--	--	

Table 6.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 864  
 Normalizing number for TCAS-TCAS cells: 1728

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	0	0	--	
i	6.02	0	0	0	0	--	
r	6.04	2	0	0	0	--	
c	6.05	4	0	0	0	--	
r							
a							
f							
t							
1		--	--	--	--	--	

Table 6.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 864  
 Normalizing number for TCAS-TCAS cells: 1728

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	7	5	--	
i	6.02	56	0	0	4	--	
r	6.04	118	4	5	13	--	
c	6.05	86	4	4	14	--	
r							
a							
f							
t							
1		--	--	--	--	--	

MITRE encounter class: 6 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 6.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 864  
 Normalizing number for TCAS-TCAS cells: 1728

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	0	7	5	—	
r	6.02	56	0	0	4	—	
c	6.04	120	4	5	13	—	
r	6.05	90	4	4	14	—	
a							
f							
t							
1		—	—	—	—	—	

MITRE encounter class: 6 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 6.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 3692  
 Normalizing number for TCAS-TCAS cells: 7384

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	44	60	49	--		
r								
c	6.02	16	28	43	19	--		
r								
a	6.04	25	30	60	27	--		
f								
t	6.05	25	20	37	12	--		
1		--	--	--	--	--		

Table 6.5

Number of nuisance RAS with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 3692  
 Normalizing number for TCAS-TCAS cells: 7384

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	3648	3409	3430	--		
r								
c	6.02	3668	7356	7333	7357	--		
r								
a	6.04	3437	7354	6960	7009	--		
f								
t	6.05	3448	7364	6995	7024	--		
1		--	--	--	--	--		

MITRE encounter class: 16 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 16.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 16.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 16.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth):      0  
 Normalizing number for TCAS-TCAS cells:      0

		A i r c r a f t    2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

MITRE encounter class: 16 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 16.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1492  
 Normalizing number for TCAS-TCAS cells: 2984

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	10	4	--	
r							
c	6.02	14	15	21	7	--	
r							
a	6.04	17	10	23	2	--	
f							
t	6.05	16	6	12	1	--	
l		--	--	--	--	--	

Table 16.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 1492  
 Normalizing number for TCAS-TCAS cells: 2984

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	1488	1169	1176	--	
r							
c	6.02	1474	2969	2959	2973	--	
r							
a	6.04	1159	2966	2549	2572	--	
f							
t	6.05	1151	2970	2556	2569	--	
l		--	--	--	--	--	



MITRE encounter class: 7 "planned = CROSSING" Date processed: 6/22/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 7.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1208  
 Normalizing number for TCAS-TCAS cells: 2416

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
l		--	--	--	--	--	

Table 7.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1208  
 Normalizing number for TCAS-TCAS cells: 2416

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	64	124	125	--	
r							
c	6.02	51	0	0	0	--	
r							
a	6.04	92	0	4	4	--	
f							
t	6.05	92	0	4	4	--	
l		--	--	--	--	--	

MITRE encounter class: 7 "planned = CROSSING" Date processed: 6/22/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 7.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1208  
 Normalizing number for TCAS-TCAS cells: 2416

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A i r c r a f t  1	Mode C	—	64	124	125	—		
	6.02	51	0	0	0	—		
	6.04	92	0	4	4	—		
	6.05	92	0	4	4	—		
		—	—	—	—	—		

MITRE encounter class: 7 "planned = CROSSING" Date processed: 6/22/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 7.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 4994  
 Normalizing number for TCAS-TCAS cells: 9988

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	425	409	422	--	
	6.02	511	97	146	146	--	
	6.04	557	121	191	190	--	
	6.05	562	125	197	196	--	
	1	--	--	--	--	--	

Table 7.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 4994  
 Normalizing number for TCAS-TCAS cells: 9988

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	4569	4556	4543	--	
	6.02	4483	9891	9842	9842	--	
	6.04	4418	9867	9761	9762	--	
	6.05	4413	9863	9755	9756	--	
	1	--	--	--	--	--	

Table 17.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 88  
 Normalizing number for TCAS-TCAS cells: 176

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	0	0	0	--	
i	6.02	0	0	0	0	--	
r	6.04	0	0	0	0	--	
c	6.05	0	0	0	0	--	
r							
a							
f							
t							
1		--	--	--	--	--	

Table 17.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 88  
 Normalizing number for TCAS-TCAS cells: 176

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	19	12	12	--	
i	6.02	17	0	0	0	--	
r	6.04	11	0	0	0	--	
c	6.05	11	0	0	0	--	
r							
a							
f							
t							
1		--	--	--	--	--	

MITRE encounter class: 17 "planned = NON CROSSING" Date processed: 6/22/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 17.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 88  
 Normalizing number for TCAS-TCAS cells: 176

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A	Mode C	—	19	12	12	—		
i	6.02	17	0	0	0	—		
r	6.04	11	0	0	0	—		
c	6.05	11	0	0	0	—		
r								
a								
f								
t								
1		—	—	—	—	—		

MITRE encounter class: 17 "planned = NON CROSSING" Date processed: 6/22/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 17.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2782  
 Normalizing number for TCAS-TCAS cells: 5564

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	0	18	21	--	
	6.02	0	5	7	7	--	
	6.04	9	4	21	19	--	
	6.05	10	3	14	14	--	
	1	--	--	--	--	--	

Table 17.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2782  
 Normalizing number for TCAS-TCAS cells: 5564

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	2752	2024	2019	--	
	6.02	2731	5559	5509	5509	--	
	6.04	2060	5508	4379	4381	--	
	6.05	2055	5509	4386	4386	--	
	1	--	--	--	--	--	

MITRE encounter class: 8 "planned = CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 8.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1296  
 Normalizing number for TCAS-TCAS cells: 2592

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	0	1	4	--	
	6.02	0	0	0	0	--	
	6.04	0	0	0	0	--	
	6.05	0	0	0	0	--	
	1	--	--	--	--	--	

Table 8.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1296  
 Normalizing number for TCAS-TCAS cells: 2592

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	35	98	89	--	
	6.02	12	0	2	2	--	
	6.04	75	20	30	30	--	
	6.05	69	20	30	30	--	
	1	--	--	--	--	--	

MITRE encounter class: 8 "planned = CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 8.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 1296  
 Normalizing number for TCAS-TCAS cells: 2592

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A								
i	Mode C	--	35	99	93	--		
r								
c	6.02	12	0	2	2	--		
r								
a	6.04	75	20	30	30	--		
f								
t	6.05	69	20	30	30	--		
1		--	--	--	--	--		



MITRE encounter class: 8 "planned = CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 8.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 5022  
 Normalizing number for TCAS-TCAS cells: 10044

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	168	182	184	--	
i	6.02	487	38	86	74	--	
r	6.04	473	118	204	184	--	
c	6.05	479	128	207	188	--	
r		--	--	--	--	--	
a							
f							
t							
1							

Table 8.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 5022  
 Normalizing number for TCAS-TCAS cells: 10044

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	4842	4520	4518	--	
i	6.02	4529	10006	9946	9958	--	
r	6.04	4310	9902	9388	9408	--	
c	6.05	4316	9892	9409	9428	--	
r		--	--	--	--	--	
a							
f							
t							
1							

MITRE encounter class: 18 "planned = NON CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 18.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A i r c r a f t  1	Mode C	--	0	0	0	--		
	6.02	0	0	0	0	--		
	6.04	0	0	0	0	--		
	6.05	0	0	0	0	--		
		--	--	--	--	--		

Table 18.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A i r c r a f t  1	Mode C	--	0	0	0	--		
	6.02	0	0	0	0	--		
	6.04	0	0	0	0	--		
	6.05	0	0	0	0	--		
		--	--	--	--	--		

MITRE encounter class: 18 "planned = NON CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 18.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 0  
 Normalizing number for TCAS-TCAS cells: 0

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A	Mode C	--	0	0	0	--		
i	6.02	0	0	0	0	--		
r	6.04	0	0	0	0	--		
c	6.05	0	0	0	0	--		
r								
a								
f								
t								
1		--	--	--	--	--		

MITRE encounter class: 18 "planned = NON CROSSING" Date processed: 6/23/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 18.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2754  
 Normalizing number for TCAS-TCAS cells: 5508

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	40	24	18	--	
r							
c	6.02	27	14	16	8	--	
r							
a	6.04	104	26	29	21	--	
f							
t	6.05	72	17	28	17	--	
1		--	--	--	--	--	

Table 18.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2754  
 Normalizing number for TCAS-TCAS cells: 5508

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	2710	2221	2198	--	
r							
c	6.02	2724	5494	5486	5494	--	
r							
a	6.04	2058	5482	4687	4673	--	
f							
t	6.05	2094	5491	4692	4685	--	
1		--	--	--	--	--	

MITRE encounter class: 9 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 9.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 579  
 Normalizing number for TCAS-TCAS cells: 1158

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	1	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
l		--	--	--	--	--	

Table 9.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 579  
 Normalizing number for TCAS-TCAS cells: 1158

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	1	27	18	--	
r							
c	6.02	17	0	0	0	--	
r							
a	6.04	52	0	2	1	--	
f							
t	6.05	61	0	0	0	--	
l		--	--	--	--	--	

MITRE encounter class: 9 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 9.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 579  
 Normalizing number for TCAS-TCAS cells: 1158

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	—	1	27	18	—	
r							
c	6.02	17	0	0	0	—	
r							
a	6.04	53	0	2	1	—	
f							
t	6.05	61	0	0	0	—	
1		—	—	—	—	—	

MITRE encounter class: 9 "planned = CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 9.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2904  
 Normalizing number for TCAS-TCAS cells: 5808

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	6	11	5	--	
i	6.02	3	1	3	5	--	
r	6.04	14	1	13	12	--	
c	6.05	2	0	13	18	--	
r		--	--	--	--	--	
a							
f							
t							
1							

Table 9.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 2904  
 Normalizing number for TCAS-TCAS cells: 5808

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A	Mode C	--	2374	1860	1956	--	
i	6.02	2267	4773	4537	4683	--	
r	6.04	1887	4763	3817	3992	--	
c	6.05	1996	4984	4017	4022	--	
r		--	--	--	--	--	
a							
f							
t							
1							

MITRE encounter class: 19 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 19.1

Number of unresolved NMACs with neither aircraft having an RA  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 285  
 Normalizing number for TCAS-TCAS cells: 570

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	0	0	0	--	
r							
c	6.02	0	0	0	0	--	
r							
a	6.04	0	0	0	0	--	
f							
t	6.05	0	0	0	0	--	
1		--	--	--	--	--	

Table 19.2

Number of unresolved NMACs with at least one aircraft having an RA  
 (based on simulation truth).

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 285  
 Normalizing number for TCAS-TCAS cells: 570

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A							
i	Mode C	--	1	36	32	--	
r							
c	6.02	5	0	0	0	--	
r							
a	6.04	8	0	0	0	--	
f							
t	6.05	5	0	0	0	--	
1		--	--	--	--	--	



MITRE encounter class: 19 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 19.3

Total number of unresolved NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that resulted in an  
 NMAC, based on simulation truth): 285  
 Normalizing number for TCAS-TCAS cells: 570

		A i r c r a f t 2						
		Mode C	6.02	6.04	6.05			
A	Mode C	—	1	36	32	—		
i	6.02	5	0	0	0	—		
r	6.04	8	0	0	0	—		
c	6.05	5	0	0	0	—		
r								
a								
f								
t								
l		—	—	—	—	—		

MITRE encounter class: 19 "planned = NON CROSSING" Date processed: 6/21/94  
 TCAS Logic Version 6.04a; All aircraft responding. June 1994

Table 19.4

Number of induced NMACs  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 4008  
 Normalizing number for TCAS-TCAS cells: 8016

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	48	132	115	--	
	6.02	29	197	194	101	--	
	6.04	68	223	233	105	--	
	6.05	35	140	176	36	--	
	1	--	--	--	--	--	

Table 19.5

Number of nuisance RAs with no NMAC  
 (based on simulation truth)

Normalizing number for cells in first row and column  
 (number of planned encounters that did not result in an  
 NMAC, based on simulation truth): 4008  
 Normalizing number for TCAS-TCAS cells: 8016

		A i r c r a f t 2					
		Mode C	6.02	6.04	6.05		
A i r c r a f t	Mode C	--	3380	2608	2617	--	
	6.02	3275	6867	6538	6631	--	
	6.04	2597	6715	5521	5651	--	
	6.05	2569	6796	5562	5698	--	
	1	--	--	--	--	--	

# APPENDIX D

## PARAMETER FILE DESCRIPTION AND PARAMETER FILE PRINTOUT FOR CLASS 9/19 6.02/6.02 6.04/6.04 6.04a/6.04a

March 29, 1994

The following is the intended format of the parameter file. The data will not include any header labels. The data will be printed in the following order.

Data_File	alpha-numeric (8 chars.),
Category	integer (0..19),
Table number	integer (1..5),
Row number	integer(1..5),
Column number	integer(1..5),
Reiteration number	integer(1..999999), (* simulation #*)
Simulation mode number	integer(16001..26414) (* simulation id *)
Geometry_Index	integer (1..9999) (* geometry id *)
AC #1 equipage	integer(0, 60, 64), (* 0 --> mode C *)
AC #2 equipage	integer(0, 60, 64), (* 0 --> mode C *)
AC #1 responding	integer(0..1), (* 0 - false, 1 - true *)
AC #2 responding	integer(0..1), (* 0 - false, 1 - true *)
Achieved separation	real(0.0../-9999.9), (* feet *)
Converging RA	integer (0..1), (* 0 - false, 1 - true *)
Crossing encounter	integer (0..1), (* 0 - false, 1 - true *)
AC #1 TA Sensitivity level	integer(0..7),
AC #2 TA Sensitivity level	integer(0..7),
AC #1 RA Sensitivity level	integer(0..7),
AC #2 RA Sensitivity level	integer(0..7),
AC #1 Mode S ID	integer(0..999),
AC #2 Mode S ID	integer(0..999),
CPA altitude separation	real(0.0../-9999.9), (* FT *)
AC #1 vertical rate	real(0.0../-9999.9), (* FPM *)
AC #2 vertical rate	real(0.0../-9999.9), (* FPM *)
AC #1 acceleration	real(0.0../-0.35?), (* G's *)
AC #2 acceleration	real(0.0../-0.35?), (* G's *)
AC #1 acceleration time	real(0.0..-99.9), (* sec. - CPA relative *)
AC #2 acceleration time	real(0.0..-99.9) (* sec. - CPA relative *)
Own Alt CPA Achieved	real(0.0../-9999.9), (* FT *)
AC #1 CPA altitude	real(0.0../-9999.9), (* FT *)
RA displayed	integer(0..2)
	(* 0 - none, 1 - AC #1,
	2 - AC #2, 3 - both *)
RA selection	integer(0..3)
	(* 0 - no selection, 1 - AC #1,
	2 - AC #2, 3 - unknown *)
Inhibit indication	integer(0..3) (* 0 - none, 1 - AC #1,
	2 - AC #2, 3 - both *)
VT Issued RA	integer (0..1) (* 0 - false, 1 - true *)
RA 600 FT Rule	integer (0..1) (* 0 - false, 1 - true *)
Level Wait	integer (0..1) (* 0 - false, 1 - true *)
Defer Display	integer (0..1) (* 0 - false, 1 - true *)
Firmness Delay	integer (0..1) (* 0 - false, 1 - true *)
Logic Crossing	integer (0..1) (* 0 - false, 1 - true *)
RA Enable Time	integer (0.. +/-90) (* time RAs were enabled
	+ -> after CPA, - -> before CPA *)
RA Disabled Time	integer (0.. +/-90) (* time RAs were disabled
	+ -> after CPA, - -> before CPA *)
RA Start Time	integer (0../-90) (* time RAs were issued
	+ -> after CPA, - -> before CPA *)
RA Ending Time	integer (0../-90) (* time RAs were ended
	+ -> after CPA, - -> before CPA *)
AC #1 RA Tracked Alt Rate	real (0../-9999)
AC #2 RA Tracked Alt Rate	real (0../-9999)
Initially Crossing RA	integer (0..1) (* 0 -> false, 1 -> true *)

AC #1 worst RA	integer(-19..19) (* Most severe RA displayed *)
AC #2 worst RA	integer(-19..19) (* Same as above *)
AC #1 initial RA	integer(-19..19) (* First RA displayed *)
AC #2 initial RA	integer(-19..19) (* Same as above *)
RA sequence time #1	real(0.0..99.9) (* 1st RA displayed *)
RA sequence severity #1	integer(+/-9..+/-21) (* see below *)
RA sequence time #2	real(0.0..99.9) (* 2nd RA displayed *)
RA sequence severity #2	integer(+/-9..+/-21) (* see below *)
RA sequence time #3	real(0.0..99.9) (* 3rd RA displayed *)
RA sequence severity #3	integer(+/-9..+/-21) (* see below *)
RA sequence time #4	real(0.0..99.9) (* 4th RA displayed *)
RA sequence severity #4	integer(+/-9..+/-21) (* see below *)
RA sequence time #5	real(0.0..99.9) (* 5th RA displayed *)
RA sequence severity #5	integer(+/-9..+/-21) (* see below *)
RA sequence time #6	real(0.0..99.9) (* 6th RA displayed *)
RA sequence severity #6	integer(+/-9..+/-21) (* see below *)
RA sequence time #7	real(0.0..99.9) (* 7th RA displayed *)
RA sequence severity #7	integer(+/-9..+/-21) (* see below *)
RA sequence time #8	real(0.0..99.9) (* 8th RA displayed *)
RA sequence severity #8	integer(+/-9..+/-21) (* see below *)
RA sequence time #9	real(0.0..99.9) (* 9th RA displayed *)
RA sequence severity #9	integer(+/-9..+/-21) (* see below *)
RA sequence time #10	real(0.0..99.9) (* 10th RA displayed *)
RA sequence severity #10	integer(+/-9..+/-21) (* see below *)
Climb Determination	real(0..99999.99)
Descend Determination	real(0..99999.99)
POT_AC1_ZD	real(0..99999.99)
POT_AC2_ZD	real(0..99999.99)
Intruder_receipt_time	real(0..99999.99)
PVMD on cycle prior to POTRA	real(0..99999.99)
PVMD on POTRA cycle	real(0..99999.99)
PVMD on INITIAL RA cycle	real(0..99999.99)

To aid in the proper use of these parameters, the following paragraphs will explain exactly what the parameters are.

**DATA FILE** - This is the name of the scenario definition file which was used to generate the encounter for this data.

**CATEGORY** - This is the number which corresponds to the MITRE encounter classes (0 - 19).

**TABLE, ROW, & COLUMN NUMBERS** - These numbers are indicators to the matrix and cell entry which corresponds to the parameter values.

**REITERATION NUMBER** - This number is an indication of the reiteration in the simulation process. The number can be used, in conjunction with the next number, by the simulation process when it is desired to re-run the simulation and select a particular encounter for more detailed review.

**SIMULATION MODE NUMBER** - This number is an indication of the equipage pairing of the simulation run. This number is used in conjunction with the previous number to select a particular encounter to be re-run. The number is a five digit value of the form, XYYZZ. X is the aircraft indication (1 or 2). YY is the logic version of own aircraft (60 or 64). ZZ is the equipage pairing identification (1 - 14).

**GEOMETRY INDEX** - This field is an indication of which geometry the simulation was running.

**AC #1 EQUIPAGE** - This is the logic version of the AC #1 aircraft (0, 60 or 64). A value of 0 is entered if the intruder is a Mode C aircraft.

AC #2 EQUIPAGE - This is the logic version of the AC #2 aircraft (0, 60 or 64). A value of 0 is entered if the intruder is a Mode C aircraft.

AC #1 RESPONDING - This is an indication of whether AC #1 is responding to its RA's.

AC #2 RESPONDING - This is an indication of whether AC #2 is responding to its RA's.

ACHIEVED SEPARATION - This is the altitude separation at CPA of the "equipped" encounter. The number is computed, using true FTEG position data, by subtracting the intruder's altitude from own's altitude.

CONVERGING RA - This is an indication of an RA which was issued and resulted in the two aircraft converging at CPA.

CROSSING ENCOUNTER - This is an indication that this encounter was a crossing encounter. This parameter is determined by comparing the true FTEG position data of the two aircraft. If a crossing is indicated then a time check is performed to see if the crossing occurred within -40 and +10 seconds relative to CPA.

AC #1 TA SENSITIVITY LEVEL - This is the sensitivity level of AC #1 at TA time.

AC #2 TA SENSITIVITY LEVEL - This is the sensitivity level of AC #2 at TA time.

AC #1 RA SENSITIVITY LEVEL - This is the sensitivity level of AC #1 at POTRA/RA time.

AC #2 RA SENSITIVITY LEVEL - This is the sensitivity level of AC #2 at POTRA/RA time.

AC #1 MODE S ID - This is AC #1's Mode S identifier.

AC #2 MODE S ID - This is AC #2's Mode S identifier.

CPA ALTITUDE SEPARATION - This is the designed vertical separation at CPA. This value is calculated from the scenario definition file information and the current reiteration number. The number is calculated by the following formula:  $AC\_1\_altitude - AC\_2\_altitude$ . With the values for the altitudes of AC 1 and AC 2 being calculated from the reiteration numbers.

AC #1 VERTICAL RATE - This is the designed vertical rate of aircraft #1. This value is calculated from the scenario definition file information and the current reiteration number.

AC #2 VERTICAL RATE - This is the designed vertical rate of aircraft #2. This value is calculated from the scenario definition file information and the current reiteration number.

AC #1 ACCELERATION - This is the designed vertical acceleration of aircraft #1. This value is calculated from the scenario definition file information and the current reiteration number. A value of 0 indicates that there was no acceleration applied.

AC #2 ACCELERATION - This is the designed vertical acceleration of aircraft #2. This value is calculated from the scenario definition file information and the current reiteration number. A value of 0 indicates that there was no acceleration applied.

AC #1 ACCELERATION TIME - This is the designed vertical acceleration time of aircraft #1. This value is calculated from the scenario definition file information and the current reiteration number. A value of 0 in this field

can have 2 possible meanings. 1). If there is no acceleration applied as indicated by the previous parameter, then this field will also be 0. 2). If an acceleration is applied then a 0 value indicated that the acceleration occurred at CPA.

AC #2 ACCELERATION TIME - This is the designed vertical acceleration time of aircraft #2. This value is calculated from the scenario definition file information and the current reiteration number. A value of 0 in this field can have 2 possible meanings. 1). If there is no acceleration applied as indicated by the previous parameter, then this field will also be 0. 2). If an acceleration is applied then a 0 value indicated that the acceleration occurred at CPA.

Own ALT CPA Achieved - This is the achieved altitude of Own aircraft at CPA. This value is from the recorded simulation true position data.

AC #1 CPA ALTITUDE - This is the designed altitude of aircraft #1 at CPA. This value is calculated from the scenario definition file information and the current reiteration number.

RA DISPLAYED - This is an indication of which aircraft displayed an RA. The possible indications are NONE, AC #1, AC #2, or BOTH.

RA SELECTION - This field is an indication of which aircraft selected the RA sense. The possible indications are NO SELECTION, AC #1, AC #2, or UNKNOWN.

INHIBIT INDICATION - Currently, this field is not used. A default value of zero is used. The field is retained for possible future use. The intended function of this field is to indicate if any aircraft was inhibited at any point during the encounter. The possible indications are NONE, AC #1, AC #2, or BOTH. This parameter is determined by reviewing the climb inhibit and descend inhibit flags at start time, TA time, RA time, CPA time, minimum altitude time, TA end time, and end time.

VT ISSUED RA - This field is an indication that the logic associated with the reduced vertical tau led to OWN's RA selection. This field is a 6.04 logic specific flag. For the parameter file, this flag is set to true if it was true at any time during the encounter.

RA 600 FT RULE - This field is an indication that the logic known as "The 600 FT RULE" led to OWN's RA selection. For the parameter file, this flag is set to true if it was true at any time during the encounter.

LEVEL WAIT - This field indicates that OWN aircraft was in a "level wait" state before issuing an RA. For the parameter file, this flag is set to true if it was true at any time during the encounter.

DEFER DISPLAY - This field indicated that OWN aircraft was in a "defer display" state before issuing an RA. For the parameter file, this flag is set to true if it was true at any time during the encounter.

FIRMNESS DELAY - This field indicates that OWN aircraft was in a "firmness delay" state before issuing an RA. For the parameter file, this flag is set to true if it was true at any time during the encounter.

LOGIC CROSSING - This field is an indication that either of the CAS logic flags OCROSS or ICROSS was set.

NOTE: THE FOLLOWING 4 FIELDS ARE TIMES RELATIVE TO CPA. CONSIDERING THE FORMAT OF THE SCENARIO DEFINITIONS, THESE FIELDS MAY CONTAIN THE FOLLOWING

"SPECIAL NUMBERS". A TIME OF -60 s INDICATES THE EVENT OCCURRED AT THE START OF THE ENCOUNTER RUN. A TIME OF +30 s INDICATES THAT THE EVENT OCCURRED AT THE END OF THE ENCOUNTER RUN.

RA ENABLE TIME - This field is an indication of the time, relative to CPA, that OWN's RAs were enabled. (- -> before CPA, + -> after CPA)

RA DISABLE TIME - This field is an indication of the time, relative to CPA, that OWN's RAs were disabled. (- -> before CPA, + -> after CPA)

RA START TIME - This field is an indication of the time, relative to CPA, that the first RA of OWN was issued. (- -> before CPA, + -> after CPA)

RA END TIME - This field is an indication of the time, relative to CPA, that the last RA of OWN was ended. (- -> before CPA, + -> after CPA)

AC #1 RA TRACKED ALT RATE - This field is the tracked altitude rate of the AC #1 aircraft at the time of the RA.

AC #2 RA TRACKED ALT RATE - This field is the tracked altitude rate of the AC #2 aircraft at the time of the RA.

INITIALLY CROSSING RA - This field is an indication that the first RA issued by OWN was a crossing RA based on the geometry of the encounter and recorded track data. The recorded track position data, along with the sense of Own's RA, is used to determine if the sense of the RA is toward the intruder aircraft. Additionally, the magnitude of the altitude difference of Own and Intruder is checked to ensure the separation is greater than 100 feet.

AC #1\_worst\_RA - This field is an indication of the most severe RA displayed by AC #1; see the translation table below. Currently, we are only recording 1 point of view. Therefore, this field will only be meaningful if the data is recorded from AC #1's point of view; otherwise, this field will contain a 0.

AC #2\_worst\_RA - Currently, this field is not used. The intent of this field is to indicate the most severe RA displayed by AC #2; see the translation table below. Currently, we are only recording 1 point of view. Therefore, this field will only be meaningful if the data is recorded from AC #2's point of view; otherwise, this field will contain a 0.

AC #1\_init\_RA - This field is an indication of the first RA displayed by AC #1; see the translation table below. Currently, we are only recording 1 point of view. Therefore, this field will only be meaningful if the data is recorded from AC #1's point of view; otherwise, this field will contain a 0.

AC #2\_init\_RA - The intent of this field is to give an indication of the first RA displayed by AC #2; see the translation table below. Currently, we are only recording 1 point of view. Therefore, this field will only be meaningful if the data is recorded from AC #2's point of view; otherwise, this field will contain a 0.

NOTE: For the following table: + = climb sense, - = descend sense.

- (\* 0 --> Only surveillance data on intruder. \*)
- (\* 1 --> Qualified for CAS evaluation. \*)
- (\* 2 --> Intruder declared a Proximity target \*)
- (\* 3 --> Intruder declared a TA non Mode C with TCAS on ground \*)
- (\* 4 --> Intruder declared a TA Mode C with TCAS on ground \*)
- (\* 5 --> Intruder declared a TA non Mode C with no aural generated \*)

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(* 6 --> Intruder declared a TA Mode C with no aural's generated *)
(* 7 --> Intruder declared a TA non Mode C *)
(* 8 --> Intruder declared a TA Mode C *)
(* 9 --> Intruder meets RA criteria but the RA is being deferred *)
(* 10 --> RA was issued but not sure what it was; used for live data *)
(* +/- 11 --> a negative advisory limit rate to 2000 FPM *)
(* +/- 12 --> a negative advisory limit rate to 1000 FPM *)
(* +/- 13 --> a negative advisory limit rate to 500 FPM *)
(* +/- 14 --> negative advisory i.e. don't climb or don't descend *)
(* +/- 15 --> positive advisory of a preventive nature *)
(* +/- 16 --> positive advisory of a corrective nature *)
(* +/- 17 --> a maintain rate RA *)
(* +/- 18 --> when either ICROSS or OCROSS is set *)
(* +/- 19 --> an increased rate RA *)
(* +/- 20 --> a sense reversal RA *)
(* +/- 21 --> an increase rate RA after a reversal RA *)
(* +/- 22 --> ADVISORY INVALID, no longer used; should not be seen *)

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**NOTE:**

The next two fields are repeated a total of ten times. They are the time and display information for RA's. The fields are an indication of the sequence in which RA's were displayed during an encounter. Due to the fixed length format of the recording process, only ten entries are permissible. If there happened to be an encounter which had a sequence of RA's which was greater than ten, then the first RA, the worst RA, and the last RA are definitely kept. The RA's which would be missing would be latest RA's assuming they were not the worst or last. The occurrence of such a long sequence is extremely rare.

**RA SEQUENCE TIME #1** - This field is the time of OWN's first RA. NOTE: since we are recording information about POTRA, this time may actually be for a POTRA.

**RA SEQUENCE SEVERITY #1** - This field contains a numeric code indicating the RA displayed by OWN. This code is the same one which is used for the AC #1/2 WORST RA present above. Since this field is only concerned with RA's then the value will be greater than 8 in magnitude.

**CLIMB DETERMINATION** - This field contains ZMPCLM, the modelling value of the predicted separation using a climb sense maneuver at the time of the first RA, if available.

**DESCEND DETERMINATION** - This field contains ZMPDES, the modelling value of the predicted separation using a descend sense maneuver at the time of the first RA, if available.

**POT AC1\_ZD** - This field contains the TRACKED altitude rate for AC1 at the time of a POTRA.

**POT AC2\_ZD** - This field contains the TRACKED altitude rate for AC2 at the time of a POTRA.

**Intruder\_receipt\_time** - This field contains the time that a message was first received from the TCAS intruder aircraft.

**PVMD on cycle prior to POTRA** - This field contains the predicted vertical miss distance (PVMD) calculated by CAS for the cycle time exactly prior to the first POTENTIAL RA CYCLE (POTRA).

**PVMD on POTRA cycle** - This field contains the predicted vertical miss distance (PVMD) calculated by CAS for the cycle time of the first POTENTIAL RA CYCLE (POTRA).

**PVMD on INITIAL RA cycle** - This field contains the predicted vertical miss distance (PVMD) calculated by CAS for the cycle time of the INITIAL RA CYCLE (RA).



SEQ NUM	CLS ROW TBL COL	PROGRAM	LEAFPA	TITLE	PARAMETER	GRADE	REPORT	PAGE
00117	9 3 3 3	c1919or	9 3 3 3	3372	2164033	3272	64 64	1 1
00118	9 3 3 3	c1919or	9 3 3 3	3272	2164133	3272	64 64	1 1
00206	9 4 2 2	c1919cf	9 4 2 2	5370	2162022	5370	62 62	1 1
00230	9 4 3 3	c1919or	9 4 3 3	796	2164133	796	64 64	1 1
00231	9 4 3 3	c1919or	9 4 3 3	1410	2164033	1410	64 64	1 1
00232	9 4 3 3	c1919or	9 4 3 3	1410	2164133	1410	64 64	1 1
00233	9 4 3 3	c1919or	9 4 3 3	1410	2164033	1410	64 64	1 1
00234	9 4 3 3	c1919or	9 4 3 3	1551	2164133	1551	64 64	1 1
00235	9 4 3 3	c1919or	9 4 3 3	1644	2164033	1644	64 64	1 1
00236	9 4 3 3	c1919or	9 4 3 3	1644	2164133	1644	64 64	1 1
00237	9 4 3 3	c1919or	9 4 3 3	1713	2164033	1713	64 64	1 1
00238	9 4 3 3	c1919or	9 4 3 3	1806	2164033	1806	64 64	1 1
00239	9 4 3 3	c1919or	9 4 3 3	2095	2164033	2095	64 64	1 1
00240	9 4 3 3	c1919or	9 4 3 3	3523	2164133	3523	64 64	1 1
00241	9 4 3 3	c1919or	9 4 3 3	5370	2164033	5370	64 64	1 1
00242	9 4 3 3	c1919or	9 4 3 3	5370	2164033	5370	64 64	1 1
00270	9 4 4 4	c1919wz	9 4 4 4	1473	2165144	1473	65 65	1 1
00271	9 4 4 4	c1919wz	9 4 4 4	1509	2165144	1509	65 65	1 1
00272	9 4 4 4	c1919wz	9 4 4 4	1644	2165144	1644	65 65	1 1
00273	9 4 4 4	c1919wz	9 4 4 4	1738	2165044	1738	65 65	1 1
00274	9 4 4 4	c1919wz	9 4 4 4	1740	2165144	1740	65 65	1 1
00275	9 4 4 4	c1919wz	9 4 4 4	1806	2165044	1806	65 65	1 1
00276	9 4 4 4	c1919wz	9 4 4 4	2095	2165144	2095	65 65	1 1
00277	9 4 4 4	c1919wz	9 4 4 4	3246	2165044	3246	65 65	1 1
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00282	9 4 4 4	c1919wz	9 4 4 4	3264	2165144	3264	65 65	1 1
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00708	19 4 2 2	c1919cf	19 4 2 2	990	2162122	990	62 62	1 1
00709	19 4 2 2	c1919cf	19 4 2 2	1151	2162022	1151	62 62	1 1
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00716	19 4 2 2	c1919cf	19 4 2 2	1638	2162122	1638	62 62	1 1
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00718	19 4 2 2	c1919cf	19 4 2 2	1800	2162122	1800	62 62	1 1
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00722	19 4 2 2	c1919cf	19 4 2 2	2293	2162022	2293	62 62	1 1
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00725	19 4 2 2	c1919cf	19 4 2 2	2447	2162022	2447	62 62	1 1
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## PROGRAM LLRPA - Full Parameter Value Report, part1of3

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SEQ NUM	CLS	ROW NUM	TBL	COL
01642	19	4	M	M
01643	19	4	M	M
01644	19	4	M	M
01645	19	4	M	M
01646	19	4	M	M
01647	19	4	M	M
01648	19	4	M	M
01649	19	4	M	M
01650	19	4	M	M
01651	19	4	M	M
01652	19	4	M	M
01653	19	4	M	M
01654	19	4	M	M
01655	19	4	M	M
01656	19	4	M	M
01657	19	4	M	M
01658	19	4	M	M
01659	19	4	M	M
01660	19	4	M	M
01661	19	4	M	M
01662	19	4	M	M
01663	19	4	M	M
01664	19	4	M	M
01665	19	4	M	M
01666	19	4	M	M
01667	19	4	M	M
01668	19	4	M	M
01669	19	4	M	M
01670	19	4	M	M
01671	19	4	M	M
01672	19	4	M	M
01673	19	4	M	M
01674	19	4	M	M
01675	19	4	M	M
01676	19	4	M	M
01677	19	4	M	M
01678	19	4	M	M
01679	19	4	M	M
01680	19	4	M	M
01681	19	4	M	M
01682	19	4	M	M
01683	19	4	M	M
01684	19	4	M	M
01685	19	4	M	M
01686	19	4	M	M
01687	19	4	M	M
01688	19	4	M	M
01689	19	4	M	M
01690	19	4	M	M
01691	19	4	M	M
01692	19	4	M	M
01693	19	4	M	M
01694	19	4	M	M
01695	19	4	M	M
01696	19	4	M	M
01697	19	4	M	M
01698	19	4	M	M
01699	19	4	M	M
01700	19	4	M	M
01701	19	4	M	M
01702	19	4	M	M
01703	19	4	M	M
01704	19	4	M	M
01705	19	4	M	M
01706	19	4	M	M
01707	19	4	M	M
01642	19	4	M	M
01643	19	4	M	M
01644	19	4	M	M
01645	19	4	M	M
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01648	19	4	M	M
01649	19	4	M	M
01650	19	4	M	M
01651	19	4	M	M
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01655	19	4	M	M
01656	19	4	M	M
01657	19	4	M	M
01658	19	4	M	M
01659	19	4	M	M
01660	19	4	M	M
01661	19	4	M	M
01662	19	4	M	M
01663	19	4	M	M
01664	19	4	M	M
01665	19	4	M	M
01666	19	4	M	M
01667	19	4	M	M
01668	19	4	M	M
01669	19	4	M	M
01670	19	4	M	M
01671	19	4	M	M
01672	19	4	M	M
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01674	19	4	M	M
01675	19	4	M	M
01676	19	4	M	M
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01679	19	4	M	M
01680	19	4	M	M
01681	19	4	M	M
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01684	19	4	M	M
01685	19	4	M	M
01686	19	4	M	M
01687	19	4	M	M
01688	19	4	M	M
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01701	19	4	M	M
01702	19	4	M	M
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## PROGRAM LLPRPA - Full Parameter Value Report, part2of3

SEQ	CLS ROW	TBL COL	NUM
00793	19	44	19
00794	19	44	19
00795	19	44	19
00796	19	44	19
00797	19	44	19
00798	19	44	19
00800	19	44	19
00801	19	44	19
00802	19	44	19
00803	19	44	19
00804	19	44	19
00805	19	44	19
00806	19	44	19
00807	19	44	19
00808	19	44	19
00809	19	44	19
00810	19	44	19
00811	19	44	19
00812	19	44	19
00813	19	44	19
00814	19	44	19
00815	19	44	19
00816	19	44	19
00817	19	44	19
00818	19	44	19
00819	19	44	19
00820	19	44	19
00821	19	44	19
00822	19	44	19
00823	19	44	19
00824	19	44	19
00825	19	44	19
00826	19	44	19
00827	19	44	19
00828	19	44	19
00829	19	44	19
00830	19	44	19
00831	19	44	19
00832	19	44	19
00833	19	44	19
00834	19	44	19
00835	19	44	19
00836	19	44	19
00837	19	44	19
00838	19	44	19
00839	19	44	19
00840	19	44	19
00841	19	44	19
00842	19	44	19
00843	19	44	19
00844	19	44	19
00845	19	44	19
00846	19	44	19
00847	19	44	19
00848	19	44	19
00849	19	44	19
00850	19	44	19
00851	19	44	19
00852	19	44	19
00853	19	44	19
00854	19	44	19
00855	19	44	19
00856	19	44	19
00857	19	44	19
00858	19	44	19
00859	19	44	19
00860	19	44	19

















SEQ CLS ROW  
NUM TBL COL

00793	19	4	2	2340.07	-1984.06	45.00	813.24	206.86	205.86	2050.11	604.57
00794	19	4	2	2340.07	-1984.06	45.00	813.24	206.86	206.86	2050.11	604.57
00795	19	4	2	2926.03	-4632.57	44.00	792.69	692.41	692.41	2631.69	1183.04
00796	19	4	2	3525.58	-4781.92	44.00	915.71	700.69	700.69	3223.99	1760.95
00797	19	4	2	4409.47	-1158.52	39.00	1029.86	315.83	315.83	4127.13	2631.69
00798	19	4	2	2926.03	-1158.52	44.00	779.85	248.43	248.43	2631.69	1183.04
00799	19	4	2	3828.63	-3000.00	42.00	835.88	739.99	739.99	3525.58	1472.02
00800	19	4	2	4409.47	-3000.00	42.00	799.04	696.01	696.01	4127.13	2631.69
00801	19	4	2	3828.63	-3000.00	42.00	799.04	696.01	696.01	4127.13	2631.69
00802	19	4	2	3828.63	-351.72	40.00	-322.11	-341.13	-341.13	3525.58	2050.11
00803	19	4	2	709.04	-4459.52	39.00	785.78	641.42	641.42	609.54	118.28
00804	19	4	2	609.54	-4772.66	33.00	775.89	611.81	611.81	609.54	118.28
00805	19	4	2	508.52	-4781.92	44.00	856.13	698.32	698.32	118.28	-14.48
00806	19	4	2	999.99	-3000.00	46.00	627.71	601.52	601.52	999.99	803.16
00807	19	4	2	2709.04	-4920.49	47.00	285.82	202.80	202.80	2609.54	2113.36
00808	19	4	2	2709.04	-4920.49	47.00	285.82	202.80	202.80	2609.54	2113.36
00809	19	4	2	2987.94	-3634.77	35.00	1114.61	700.73	700.73	2987.94	2508.52
00810	19	4	2	2987.94	-3634.77	35.00	1114.61	700.73	700.73	2987.94	2508.52
00811	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00812	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00813	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00814	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00815	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00816	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00817	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00818	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00819	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00820	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00821	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00822	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00823	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00824	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00825	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00826	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00827	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00828	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00829	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00830	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00831	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00832	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00833	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00834	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00835	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00836	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00837	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00838	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00839	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00840	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00841	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00842	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00843	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00844	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00845	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00846	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00847	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00848	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00849	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00850	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00851	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00852	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00853	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00854	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00855	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71
00856	19	4	2	2709.04	-1968.09	38.00	982.74	616.77	616.77	2709.04	2210.57
00857	19	4	2	2803.16	-4459.52	39.00	753.53	705.07	705.07	2508.52	2016.71

SEQ	CLS	ROW	TOT	TBL	COL
NUM					

[illegible]



SEQ NUM	CLS ROW	TBL COL	333.92	-136.83	3828.63	-2869.57	41.00	609.48	510.30	510.30	510.30	3525.58	2050.11
01576	19	4	0	0	0	0	0	0	0	0	0	0	0
01577	19	4	0	0	0	0	0	0	0	0	0	0	0
01578	19	4	0	0	0	0	0	0	0	0	0	0	0
01579	19	4	0	0	0	0	0	0	0	0	0	0	0
01580	19	4	0	0	0	0	0	0	0	0	0	0	0
01581	19	4	0	0	0	0	0	0	0	0	0	0	0
01582	19	4	0	0	0	0	0	0	0	0	0	0	0
01583	19	4	0	0	0	0	0	0	0	0	0	0	0
01584	19	4	0	0	0	0	0	0	0	0	0	0	0
01585	19	4	0	0	0	0	0	0	0	0	0	0	0
01586	19	4	0	0	0	0	0	0	0	0	0	0	0
01587	19	4	0	0	0	0	0	0	0	0	0	0	0
01588	19	4	0	0	0	0	0	0	0	0	0	0	0
01589	19	4	0	0	0	0	0	0	0	0	0	0	0
01590	19	4	0	0	0	0	0	0	0	0	0	0	0
01591	19	4	0	0	0	0	0	0	0	0	0	0	0
01592	19	4	0	0	0	0	0	0	0	0	0	0	0
01593	19	4	0	0	0	0	0	0	0	0	0	0	0
01594	19	4	0	0	0	0	0	0	0	0	0	0	0
01595	19	4	0	0	0	0	0	0	0	0	0	0	0
01596	19	4	0	0	0	0	0	0	0	0	0	0	0
01597	19	4	0	0	0	0	0	0	0	0	0	0	0
01598	19	4	0	0	0	0	0	0	0	0	0	0	0
01599	19	4	0	0	0	0	0	0	0	0	0	0	0
01600	19	4	0	0	0	0	0	0	0	0	0	0	0
01601	19	4	0	0	0	0	0	0	0	0	0	0	0
01602	19	4	0	0	0	0	0	0	0	0	0	0	0
01603	19	4	0	0	0	0	0	0	0	0	0	0	0
01604	19	4	0	0	0	0	0	0	0	0	0	0	0
01605	19	4	0	0	0	0	0	0	0	0	0	0	0
01606	19	4	0	0	0	0	0	0	0	0	0	0	0
01607	19	4	0	0	0	0	0	0	0	0	0	0	0
01608	19	4	0	0	0	0	0	0	0	0	0	0	0
01609	19	4	0	0	0	0	0	0	0	0	0	0	0
01610	19	4	0	0	0	0	0	0	0	0	0	0	0
01611	19	4	0	0	0	0	0	0	0	0	0	0	0
01612	19	4	0	0	0	0	0	0	0	0	0	0	0
01613	19	4	0	0	0	0	0	0	0	0	0	0	0
01614	19	4	0	0	0	0	0	0	0	0	0	0	0
01615	19	4	0	0	0	0	0	0	0	0	0	0	0
01616	19	4	0	0	0	0	0	0	0	0	0	0	0
01617	19	4	0	0	0	0	0	0	0	0	0	0	0
01618	19	4	0	0	0	0	0	0	0	0	0	0	0
01619	19	4	0	0	0	0	0	0	0	0	0	0	0
01620	19	4	0	0	0	0	0	0	0	0	0	0	0
01621	19	4	0	0	0	0	0	0	0	0	0	0	0
01622	19	4	0	0	0	0	0	0	0	0	0	0	0
01623	19	4	0	0	0	0	0	0	0	0	0	0	0
01624	19	4	0	0	0	0	0	0	0	0	0	0	0
01625	19	4	0	0	0	0	0	0	0	0	0	0	0
01626	19	4	0	0	0	0	0	0	0	0	0	0	0
01627	19	4	0	0	0	0	0	0	0	0	0	0	0
01628	19	4	0	0	0	0	0	0	0	0	0	0	0
01629	19	4	0	0	0	0	0	0	0	0	0	0	0
01630	19	4	0	0	0	0	0	0	0	0	0	0	0
01631	19	4	0	0	0	0	0	0	0	0	0	0	0
01632	19	4	0	0	0	0	0	0	0	0	0	0	0
01633	19	4	0	0	0	0	0	0	0	0	0	0	0
01634	19	4	0	0	0	0	0	0	0	0	0	0	0
01635	19	4	0	0	0	0	0	0	0	0	0	0	0
01636	19	4	0	0	0	0	0	0	0	0	0	0	0
01637	19	4	0	0	0	0	0	0	0	0	0	0	0
01638	19	4	0	0	0	0	0	0	0	0	0	0	0
01639	19	4	0	0	0	0	0	0	0	0	0	0	0
01640	19	4	0	0	0	0	0	0	0	0	0	0	0
01641	19	4	0	0	0	0	0	0	0	0	0	0	0

[illegible]







# APPENDIX E

## SUMMARY NMAC TABLES

MITRE encounter classes: 0,10 Date processed: 6/22/94  
 Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
 Failure : separation at CPA <= 100 ft based on simulation truth  
 Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table	0.3	-	Percent of unresolved failures			
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table	0.4	-	Percent of induced failures			
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table	10.3	-	Percent of unresolved failures			
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table	10.4	-	Percent of induced failures			
	6.02 only	6.04 only	6.04A only	6.02 / 5.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

MITRE encounter classes: 1,11 Date processed: 6/22/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 1.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 1.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 11.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 11.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

MITRE encounter classes: 2,12 Date processed: 6/22/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 2.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	** 0.579	** 0.579	** 0.116	** 0.116	** 0.579
One Mode C	0.231	** >> 1.620	** >> 1.620	-----	-----	-----

Table 2.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.396	** >> 1.715	** >> 1.715	0.594	0.594	** >> 1.715
One Mode C	8.641	7.685	7.685	-----	-----	-----

Table 12.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 12.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	** 0.046	** 0.046	0.000	0.000	** 0.046
One Mode C	0.465	0.604	0.604	-----	-----	-----

MITRE encounter classes: 3,13 Date processed: 6/20/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 3.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	2.310	4.484	4.484	-----	-----	-----	

Table 3.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	0.000	0.000	0.000	-----	-----	-----	

Table 13.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	0.781	0.781	0.781	-----	-----	-----	

Table 13.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	** 0.467	** 0.089	** 0.178	** 0.089	** 0.234	
One Mode C	0.178	** 0.823	** 0.667	-----	-----	-----	

MITRE encounter classes: 4,14 Date processed: 6/22/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>) = 1.0 %

Table 4.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 4.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	** 0.329	0.000	-----	-----	-----

Table 14.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

Table 14.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

MITRE encounter classes: 5,15 Date processed: 6/20/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 5.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	4.367	6.076	6.139	-----	-----	-----

Table 5.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.053	** 0.347	** 0.347	0.107	0.107	** 0.347
One Mode C	2.885	3.632	3.566	-----	-----	-----

Table 15.3 - Percent of unresolved failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	18.919	17.568	16.892	-----	-----	-----

Table 15.4 - Percent of induced failures

	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	** 0.972	** 0.729	** 0.365	** 0.191	** 0.903
One Mode C	0.556	0.313	0.521	-----	-----	-----

MITRE encounter classes: 6,16 Date processed: 6/24/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>) = 1.0 %

Table 6.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	**	**	**	**	**	
		0.289	0.810	0.116	0.231	0.492	
One Mode C	3.241	** >>	5.498	-----	-----	-----	

Table 6.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.379	**	0.163	0.494	0.264	0.433	
		0.813					
One Mode C	0.813	1.151	1.002	-----	-----	-----	

Table 16.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	0.000	0.000	0.000	-----	-----	-----	

Table 16.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.503	0.771	0.034	0.519	0.218	0.235	
One Mode C	0.469	0.905	0.670	-----	-----	-----	

MITRE encounter classes: 7,17 Date processed: 6/24/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 7.3		Percent of unresolved failures					
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	** 0.166	** 0.166	0.000	0.000	** 0.166	†
One Mode C	4.760	8.940	8.982	-----	-----	-----	

Table 7.4		Percent of induced failures					
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.971	1.912	** >> 1.962	1.337	1.357	1.937	
One Mode C	9.371	9.672	9.852	-----	-----	-----	

Table 17.3		Percent of unresolved failures					
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	20.455	13.068	13.068	-----	-----	-----	

Table 17.4		Percent of induced failures					
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.090	** 0.377	** 0.252	0.099	0.090	** 0.297	
One Mode C	0.000	** 0.485	** 0.557	-----	-----	-----	



MITRE encounter classes: 8,18 Date processed: 6/25/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

	Table	8.3	-	Percent of unresolved failures		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	** >> 1.157	** >> 1.157	** 0.424	** 0.424	** >> 1.157
One Mode C	1.813	** >> 6.713	** >> 6.250	-----	-----	-----

	Table	8.4	-	Percent of induced failures		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.378	** >> 2.031	** >> 1.872	** >> 1.016	** >> 1.006	** >> 1.946
One Mode C	6.521	6.521	6.601	-----	-----	-----

	Table	18.3	-	Percent of unresolved failures		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000
One Mode C	0.000	0.000	0.000	-----	-----	-----

	Table	18.4	-	Percent of induced failures		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
TCAS-TCAS	0.254	** 0.527	0.309	0.381	0.227	0.445
One Mode C	1.216	2.324	1.634	-----	-----	-----

MITRE encounter classes: 9,19 Date processed: 6/23/94  
Based on FAA Technical Center data of : 3/25/94 All TCAS Responding  
Failure : separation at CPA <= 100 ft based on simulation truth  
Ratio threshold (\*\*) = 2.00 Significance threshold (>>) = 1.0 %

Table 9.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	** 0.173	0.000	0.000	0.000	** 0.043	
One Mode C	1.554	** >> 6.908	** >> 6.822	-----	-----	-----	

Table 9.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.017	** 0.224	** 0.310	0.034	** 0.043	** 0.215	
One Mode C	0.155	** 0.430	0.121	-----	-----	-----	

Table 19.3 - Percent of unresolved failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	0.000	0.000	0.000	0.000	0.000	0.000	
One Mode C	1.053	** >> 7.719	** >> 6.491	-----	-----	-----	

Table 19.4 - Percent of induced failures							
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
TCAS-TCAS	2.458	2.907	0.449	2.601	1.503	1.753	
One Mode C	0.961	** >> 2.495	1.871	-----	-----	-----	

## **APPENDIX F**

### **NMACs AS A FUNCTION OF PARAMETER VALUES**

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PROGRAM LLRPDU - Frequency (COUNT) of Multiple Valued Parameters; (---) are excluded parameters. Thu, 23 Mar 1995, Page 4																									
CLASS	TBL	ROW	COL	EQ	EQ	AC1	AC2	RES	RES	Com	Nmb	Com	Parameter	COUNT	HI	ID	CPA	SEP	AC1	AC2	ACC	AC1	AC2	TIM	ALT
15	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	18)	2	-	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	1	0100000000	(	3)	-	-250.00	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	1	0100000000	(	3)	-	-750.00	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	1	0100000000	(	13)	-	-500.00	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	4	1	0010000000	(	3)	-	-	-	1000.0	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	4	1	0010000000	(	7)	-	-	-	5000.0	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	4	1	0010000000	(	11)	-	-	-	3000.0	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	1)	-	-	-	-	0.15	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	1)	-	-	-	-	0.25	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	9)	-	-	-	-	0.35	-	-	-25.0	-	-
15	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	11)	-	-	-	-	-	-	-	-20.0	-	-
15	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	5)	-	-	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	16)	-	-	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	5	0000000001	(	3)	-	-	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	5	0000000001	(	2)	-	-	-	-	-	-	-	-	-	-
15	4	4	4	65	65	65	65	1	1	1	2	5	0000000001	(	10)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	7)	1	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	7)	2	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	1)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	2	8	0100000000	(	13)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	6	0001000000	(	12)	-	-	-	5000.0	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	6	0001000000	(	1)	-	-	-	3000.0	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	6	0000100000	(	13)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	6	0000100000	(	4)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	5)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	5)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	3	2	0000010000	(	7)	-	-	-	-	-	-	-	-	-	-
17	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	7)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	7)	2	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	10)	1	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	2)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	7)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	4	4	0010000000	(	8)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	4	4	0010000000	(	4)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	8	8	0010000000	(	13)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	6	0001000000	(	4)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	6	0001000000	(	6)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	6	0000100000	(	4)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	6	0000100000	(	9)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	3	2	0000100000	(	1)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	3	2	0000100000	(	2)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	3	2	0000100000	(	4)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	3	2	0000100000	(	2)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	2)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	5)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	2	0000000010	(	10)	-	-	-	-	-	-	-	-	-	-
18	4	4	4	65	65	65	65	1	1	1	1	2	0000000001	(	15)	-	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	16)	2	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	1	1	1000000000	(	20)	1	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	2)	-	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	6)	-	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	2	2	0100000000	(	19)	-	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	4	4	0010000000	(	3)	-	-	-	-	-	-	-	-	-	-
19	4	4	4	65	65	65	65	1	1	1	4	4	0010000000	(	9)	-	-	-	-	-	-	-	-	-	-





## **APPENDIX G**

### **NMACs AS A FUNCTION OF LOGIC VERSION**







## Page 4-

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TBL	REIT Modes		CPA Alt	AC#1 Rate	AC#2 Rate	AC#1 Acc.	AC#2 Acc.	AC#1 Time	AC#2 Time	AC #1 CPA Alt	Cell 3,3			Cell 4,4			
	#1	#2									R	C	R	C	R	C	R
13 4	561	10	5	0.0	5000.0	0.00	-0.25	0.0	-20.0	3680.0							
13 4	1533	10	5	0.0	5000.0	0.00	-0.25	0.0	-20.0	3720.0							
13 4	-----				Subtotal =												
15 4	4471	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	7480.0							
15 4	4472	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	7480.0							
15 4	3023	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3720.0							
15 4	4555	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	7480.0							
15 4	6047	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	7520.0							
15 4	1442	5	10	5000.0	5000.0	0.00	0.25	0.0	-25.0	3680.0							
15 4	2954	5	10	5000.0	5000.0	0.00	0.25	0.0	-25.0	3720.0							
15 4	1505	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	3680.0							
15 4	3017	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	3720.0							
15 4	4529	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	7480.0							
15 4	-----				Subtotal =												
15 4	1447	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	3680.0							
15 4	1510	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3680.0							
15 4	944	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	3720.0							
15 4	2519	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3720.0							
15 4	5543	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3720.0							
15 4	1196	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	3680.0							
15 4	2708	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	3720.0							
15 4	5732	5	10	5000.0	5000.0	0.00	0.25	0.0	-20.0	3720.0							
15 4	1359	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3680.0							
15 4	4283	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	7480.0							
15 4	5795	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	7520.0							
15 4	1511	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3680.0							
15 4	1511	5	10	5000.0	5000.0	0.00	0.35	0.0	-20.0	3680.0							
15 4	1190	5	10	5000.0	5000.0	0.00	0.25	0.0	-25.0	3720.0							
15 4	2702	5	10	5000.0	5000.0	0.00	0.25	0.0	-25.0	7480.0							
15 4	4214	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	3680.0							
15 4	1253	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	3720.0							
15 4	2765	5	10	5000.0	5000.0	0.00	0.35	0.0	-25.0	3720.0							
15 4	-----				Subtotal =												
15 4	1384	5	10	5000.0	5000.0	0.00	0.15	0.0	-20.0	3680.0							
15 4	2960	10	5	5000.0	5000.0	0.00	0.25	0.0	-20.0	3720.0							
15 4	3023	10	5	5000.0	5000.0	0.00	0.35	0.0	-20.0	3720.0							
15 4	-----				Subtotal =												
16 4	901	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3680.0							
16 4	3925	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7480.0							
16 4	2407	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3720.0							
16 4	5431	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7520.0							
16 4	965	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	3989	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	958	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	3997	5	10	1000.0	-3000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	2471	10	5	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	5495	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7520.0							
16 4	2660	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	3720.0							
16 4	2660	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	3720.0							
16 4	5684	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	7520.0							
16 4	5684	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	7520.0							
16 4	-----				Subtotal =												
16 4	901	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3680.0							
16 4	3925	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7480.0							
16 4	2407	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3720.0							
16 4	5431	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7520.0							
16 4	965	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	3989	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	958	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	3997	5	10	1000.0	-3000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	2471	10	5	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	5495	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7520.0							
16 4	2660	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	3720.0							
16 4	2660	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	3720.0							
16 4	5684	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	7520.0							
16 4	5684	5	10	3000.0	-5000.0	0.00	0.25	0.0	-25.0	7520.0							
16 4	-----				Subtotal =												
16 4	901	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3680.0							
16 4	3925	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7480.0							
16 4	2407	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	3720.0							
16 4	5431	5	10	1000.0	-5000.0	0.00	0.25	0.0	-20.0	7520.0							
16 4	965	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	2477	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	3720.0							
16 4	3989	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	958	5	10	1000.0	-5000.0	0.00	0.35	0.0	-20.0	7480.0							
16 4	3997	5	10	1000.0	-3000.0	0.00	0.35	0.0	-20.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3680.0							
16 4	959	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	2471	10	5	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	3720.0							
16 4	3983	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7480.0							
16 4	5495	5	10	1000.0	-5000.0	0.00	0.35	0.0	-25.0	7520.0							
16 4																	









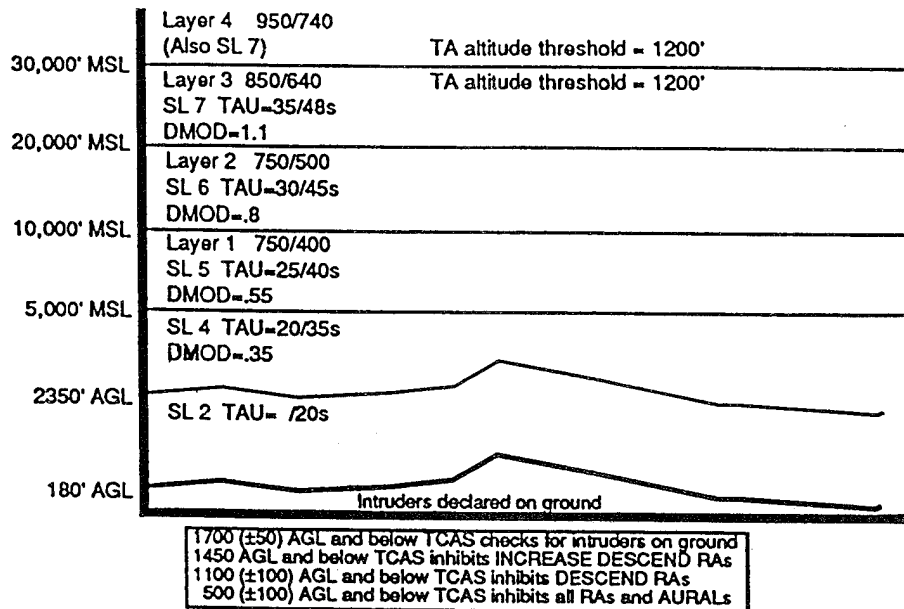




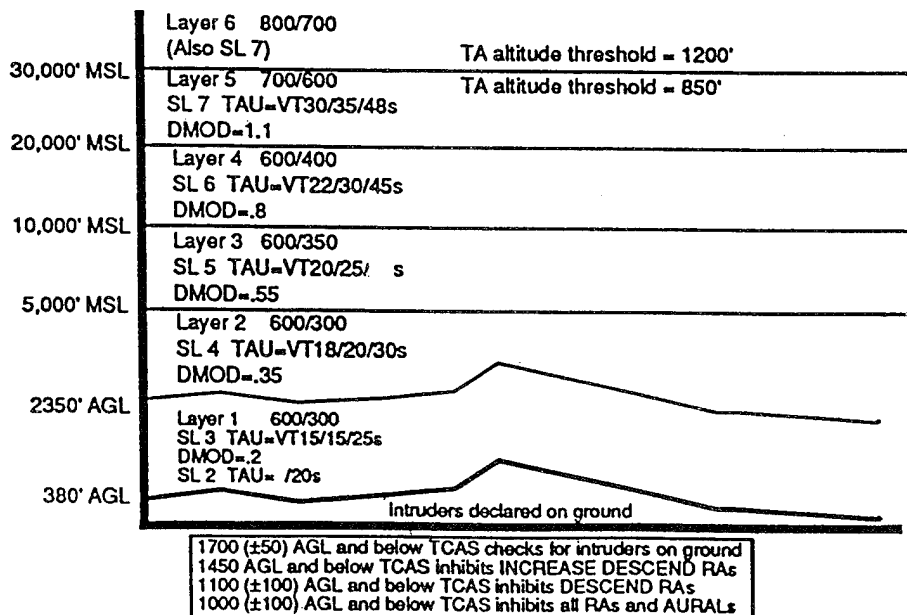


## APPENDIX H

### CAS THRESHOLDS, LAYERS, AND SENSITIVITY LEVELS<sup>1</sup>



#### Thresholds for Logic Versions 6.02 and 6.02



#### Thresholds for Logic Versions 6.04 and 6.04a

<sup>1</sup> Bradley, Suzanne, "Simulation Test and Evaluation of TCAS II Logic Version 6.04." The MITRE Corporation, McLean, VA, MTR 92W0000103, July 1992.

## **APPENDIX I**

### **PERFORMANCE STATISTICS OUTPUTS**

MITRE encounter classes: 0,10 Date processed: 6/23/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 3012  
Total incorrectly labelled RAs : 12

Class		0		TCAS - TCAS		Both Responding	
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	100.00	100.00	100.00	100.00	100.00	100.00
Crossing RAs/ RAs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Crossing RAs/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ cross RAs (%)		0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs*	(%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)		25.75	22.75	22.75	25.75	25.75	22.75
Avg alt sep at CPA* (ft)		734.39	662.25	662.25	710.46	710.46	662.25

Class		10		TCAS - TCAS		Both Responding	
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	90.84	63.64	63.64	75.91	75.91	63.64
Crossing RAs/ RAs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Crossing RAs/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ cross RAs (%)		0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs*	(%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)		22.50	20.76	20.76	22.87	22.87	20.76
Avg alt sep at CPA* (ft)		747.13	672.11	672.11	720.53	720.53	672.11

\* NMACs and average alt. sep. at CPA are based on simulation truth

\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 1,11 Date processed: 6/23/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 9044  
Total incorrectly labelled RAs : 28

	Class 1		TCAS - TCAS		Both Responding	
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs (%)	100.00	96.28	96.28	96.28	96.41	96.28
Crossing RAs/ RAs (%)	5.85	12.43	9.25	13.40	9.52	10.84
Crossing RAs/ runs (%)	5.85	11.97	8.91	12.90	9.18	10.44
Cr. RA NMACs/ cross RAs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs* (%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)	22.62	16.70	17.14	20.78	21.20	16.88
Avg alt sep at CPA* (ft)	929.10	758.81	763.20	845.15	845.88	760.82

	Class 11		TCAS - TCAS		Both Responding	
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs (%)	100.00	59.38	59.38	74.90	74.90	59.38
Crossing RAs/ RAs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Crossing RAs/ runs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ cross RAs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs* (%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs (%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)	14.47	10.76	10.76	13.95	13.95	10.76
Avg alt sep at CPA* (ft)	737.53	666.19	666.19	707.56	707.56	666.19

\* NMACs and average alt. sep. at CPA are based on simulation truth  
\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 2,12 Date processed: 6/23/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 108424  
Total incorrectly labelled RAs : 440

	Class	2	TCAS - TCAS Both Responding				
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAs/ runs	(%)	100.00	99.45	99.45	98.90	98.90	99.45
Crossing RAs/ RAs	(%)	0.51	2.28	2.32	0.53	0.53	2.30
Crossing RAs/ runs	(%)	0.51	2.27	2.31	0.53	0.53	2.29
Cr. RA NMACs/ cross RAs (%)		0.00	1.13	1.11	0.00	0.00	1.12
Cr. RA NMACs/ NMACs*	(%)	0.00	1.75	1.75	0.00	0.00	1.75
NMACs*/ runs	(%)	0.31	1.46	1.46	0.49	0.49	1.46
Avg warning time** (sec)		19.36	15.88	15.89	18.35	18.35	15.88
Avg alt sep at CPA* (ft)		691.50	607.19	607.17	651.61	651.61	607.18

	Class	12	TCAS - TCAS Both Responding				
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAS/ runs	(%)	99.95	73.58	73.58	85.24	85.24	73.58
Crossing RAs/ RAs	(%)	0.28	0.38	0.38	0.33	0.33	0.38
Crossing RAs/ runs	(%)	0.28	0.28	0.28	0.29	0.29	0.28
Cr. RA NMACs/ cross RAs (%)		0.00	8.33	8.33	0.00	0.00	8.33
Cr. RA NMACs/ NMACs*	(%)	0.00	50.00	50.00	0.00	0.00	50.00
NMACs*/ runs	(%)	0.00	0.05	0.05	0.00	0.00	0.05
Avg warning time** (sec)		15.80	15.10	15.10	16.67	16.67	15.10
Avg alt sep at CPA* (ft)		787.82	732.04	732.04	768.71	768.71	732.04

\* NMACs and average alt. sep. at CPA are based on simulation truth  
\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 3,13 Date processed: 6/21/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 139726  
Total incorrectly labelled RAS : 242

Class		3	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAS/ runs	(%)	83.48	70.75	70.75	77.49	77.49	70.75
Crossing RAS/ RAS	(%)	11.86	13.36	10.72	13.70	10.95	12.04
Crossing RAS/ runs	(%)	9.90	9.45	7.58	10.62	8.48	8.52
Cr. RA NMACs/ cross RAS (%)		0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs*	(%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)		17.98	16.70	17.07	17.70	18.02	16.82
Avg alt sep at CPA* (ft)		798.99	720.50	728.55	765.50	770.36	721.87

Class		13	TCAS - TCAS		Both Responding		
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	76.72	59.20	59.35	69.91	70.05	59.22
Crossing RAs/ RAs	(%)	15.86	19.23	14.52	17.76	14.87	16.82
Crossing RAs/ runs	(%)	12.17	11.39	8.62	12.41	10.42	9.96
Cr. RA NMACs/ cross RAs (%)		0.00	3.99	1.00	1.40	0.83	2.28
Cr. RA NMACs/ NMACs*	(%)	0.00	100.00	100.00	100.00	100.00	100.00
NMACs*/ runs	(%)	0.00	0.45	0.09	0.17	0.09	0.23
Avg warning time** (sec)		21.85	19.94	20.27	21.50	21.73	20.03
Avg alt sep at CPA* (ft)		941.70	844.26	867.88	905.31	919.88	853.03

\* NMACs and average alt. sep. at CPA are based on simulation truth  
\*\* Average warning time includes negative times (ie, RA occurs after CPA)



MITRE encounter classes: 4,14 Date processed: 6/23/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 18144  
Total incorrectly labelled RAs : 0

	Class	4	TCAS - TCAS Both Responding				
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	100.00	96.77	96.84	95.95	96.05	96.70
Crossing RAs/ RAs	(%)	22.87	17.39	7.66	18.61	15.41	11.93
Crossing RAs/ runs	(%)	22.87	16.83	7.42	17.86	14.80	11.54
Cr. RA NMACs/ cross RAs (%)		0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs*	(%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)		23.59	19.54	19.87	22.40	22.64	19.69
Avg alt sep at CPA* (ft)		1081.05	942.17	948.61	1018.66	1023.71	943.61

	Class	14	TCAS - TCAS Both Responding				
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	94.29	68.57	68.57	77.59	77.59	68.57
Crossing RAs/ RAs	(%)	9.09	10.42	10.42	11.05	11.05	10.42
Crossing RAs/ runs	(%)	8.57	7.14	7.14	8.57	8.57	7.14
Cr. RA NMACs/ cross RAs (%)		0.00	0.00	0.00	0.00	0.00	0.00
Cr. RA NMACs/ NMACs*	(%)	0.00	0.00	0.00	0.00	0.00	0.00
NMACs*/ runs	(%)	0.00	0.00	0.00	0.00	0.00	0.00
Avg warning time** (sec)		17.14	14.34	14.34	17.30	17.30	14.34
Avg alt sep at CPA* (ft)		846.34	709.93	709.93	788.05	788.05	709.93

\* NMACs and average alt. sep. at CPA are based on simulation truth  
\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 5,15 Date processed: 6/21/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 217624  
Total incorrectly labelled RAs : 104

Class		5	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAs/ runs	(%)	99.64	95.94	95.91	97.45	97.44	95.92
Crossing RAs/ RAs	(%)	5.84	8.47	5.39	7.31	5.03	6.83
Crossing RAs/ runs	(%)	5.82	8.12	5.17	7.12	4.90	6.55
Cr. RA NMACs/ cross RAs (%)		0.00	0.07	0.11	0.00	0.00	0.08
Cr. RA NMACs/ NMACs*	(%)	0.00	1.92	1.92	0.00	0.00	1.92
NMACs*/ runs	(%)	0.04	0.29	0.29	0.09	0.09	0.29
Avg warning time** (sec)		19.03	16.34	16.49	17.97	18.11	16.38
Avg alt sep at CPA* (ft)		875.88	758.08	759.26	818.20	819.82	758.42

Class		15	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAS/ runs	(%)	95.87	73.58	73.15	82.73	82.56	73.33
Crossing RAs/ RAs	(%)	7.65	12.10	8.74	10.74	8.07	10.03
Crossing RAs/ runs	(%)	7.33	8.91	6.39	8.89	6.67	7.35
Cr. RA NMACs/ cross RAs (%)		0.00	7.24	6.46	2.80	1.24	7.87
Cr. RA NMACs/ NMACs*	(%)	0.00	69.64	59.52	71.43	45.45	67.31
NMACs*/ runs	(%)	0.00	0.93	0.69	0.35	0.18	0.86
Avg warning time** (sec)		17.20	14.39	14.52	16.84	16.94	14.40
Avg alt sep at CPA* (ft)		942.15	787.74	808.46	874.05	892.87	799.25

\* NMACs and average alt. sep. at CPA are based on simulation truth  
\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 6,16 Date processed: 6/24/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 216175  
Total incorrectly labelled RAs : 1553

	Class	6	TCAS - TCAS	Both Responding			
	6.02	6.04	6.04A	6.02 /	6.02 /	6.04 /	
	only	only	only	6.04	6.04A	6.04A	
RAs/ runs	(%)	99.91	94.76	94.98	97.03	96.74	94.33
Crossing RAs/ RAs	(%)	26.35	21.56	17.45	24.58	22.20	19.30
Crossing RAs/ runs	(%)	26.33	20.43	16.58	23.85	21.47	18.20
Cr. RA NMACs/ cross RAs (%)		1.00	2.58	0.63	1.41	0.73	1.19
Cr. RA NMACs/ NMACs*	(%)	85.71	73.85	36.54	79.22	61.96	50.00
NMACs*/ runs	(%)	0.31	0.71	0.29	0.42	0.25	0.43
Avg warning time** (sec)		20.00	17.33	18.38	18.99	19.67	17.83
Avg alt sep at CPA* (ft)		899.64	791.56	850.60	850.95	883.07	817.92

	Class	16	TCAS - TCAS	Both Responding			
	6.02	6.04	6.04A	6.02 /	6.02 /	6.04 /	
	only	only	only	6.04	6.04A	6.04A	
RAs/ runs	(%)	99.26	77.95	77.93	88.72	88.65	77.88
Crossing RAs/ RAs	(%)	29.78	24.03	13.50	28.22	23.08	18.56
Crossing RAs/ runs	(%)	29.56	18.73	10.52	25.04	20.46	14.46
Cr. RA NMACs/ cross RAs (%)		1.70	4.16	0.33	2.11	1.08	1.62
Cr. RA NMACs/ NMACs*	(%)	100.00	100.00	100.00	100.00	100.00	100.00
NMACs*/ runs	(%)	0.50	0.78	0.03	0.53	0.22	0.23
Avg warning time** (sec)		17.91	18.47	18.93	18.67	18.84	18.61
Avg alt sep at CPA* (ft)		819.83	794.06	859.77	813.45	849.56	823.15

\* NMACs and average alt. sep. at CPA are based on simulation truth

\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 7,17 Date processed: 6/25/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 325998  
Total incorrectly labelled RAs : 594

Class		7	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAs/ runs	(%)	99.93	99.32	99.32	99.24	99.24	99.32
Crossing RAs/ RAs	(%)	1.50	3.95	3.20	1.90	1.67	3.56
Crossing RAs/ runs	(%)	1.50	3.93	3.18	1.89	1.65	3.54
Cr. RA NMACs/ cross RAs (%)		0.00	0.31	0.38	0.00	0.00	0.34
Cr. RA NMACs/ NMACs*	(%)	0.00	0.77	0.75	0.00	0.00	0.76
NMACs*/ runs	(%)	0.78	1.57	1.61	1.08	1.09	1.59
Avg warning time** (sec)		17.52	14.79	14.77	16.63	16.62	14.78
Avg alt sep at CPA* (ft)		714.39	616.33	616.19	673.69	673.47	616.26

Class		17		TCAS - TCAS		Both Responding	
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	95.98	71.94	71.94	83.40	83.38	71.94
Crossing RAs/ RAs	(%)	1.17	2.09	1.99	1.61	1.58	2.04
Crossing RAs/ runs	(%)	1.12	1.50	1.43	1.34	1.31	1.47
Cr. RA NMACs/ cross RAs (%)		7.75	23.98	16.56	7.19	6.67	19.16
Cr. RA NMACs/ NMACs*	(%)	100.00	97.62	96.43	100.00	100.00	96.97
NMACs*/ runs	(%)	0.09	0.37	0.25	0.10	0.09	0.29
Avg warning time** (sec)		17.93	16.08	16.08	18.11	18.11	16.08
Avg alt sep at CPA* (ft)		982.94	856.35	857.00	939.91	940.08	856.70

\* NMACs and average alt. sep. at CPA are based on simulation truth

\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 8,18 Date processed: 6/25/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 323036  
Total incorrectly labelled RAS : 3556

	Class	8	TCAS - TCAS			Both Responding	
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	99.19	94.77	95.04	96.92	96.96	94.82
Crossing RAs/ RAS	(%)	7.94	11.97	8.78	8.84	7.45	10.63
Crossing RAs/ runs	(%)	7.87	11.34	8.34	8.57	7.22	10.08
Cr. RA NMACs/ cross RAS (%)		0.00	1.61	0.77	0.65	0.69	1.29
Cr. RA NMACs/ NMACs*	(%)	0.00	9.91	3.71	6.22	5.58	7.24
NMACs*/ runs	(%)	0.30	1.85	1.72	0.90	0.89	1.79
Avg warning time** (sec)		17.97	15.49	16.00	17.20	17.46	15.69
Avg alt sep at CPA* (ft)		831.94	705.38	730.37	777.25	786.48	712.75

	Class	18	TCAS - TCAS			Both Responding	
		6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A
RAs/ runs	(%)	98.39	79.49	79.02	88.32	88.29	79.16
Crossing RAs/ RAS	(%)	13.17	17.28	11.16	15.39	12.32	13.93
Crossing RAs/ runs	(%)	12.96	13.73	8.82	13.59	10.88	11.02
Cr. RA NMACs/ cross RAS (%)		1.97	3.10	2.33	2.52	1.58	2.99
Cr. RA NMACs/ NMACs*	(%)	100.00	80.70	66.67	88.10	75.51	74.74
NMACs*/ runs	(%)	0.26	0.53	0.31	0.39	0.23	0.44
Avg warning time** (sec)		16.74	15.72	16.33	17.01	17.24	15.88
Avg alt sep at CPA* (ft)		905.74	787.22	840.98	859.26	883.20	809.62

\* NMACs and average alt. sep. at CPA are based on simulation truth

\*\* Average warning time includes negative times (ie, RA occurs after CPA)

MITRE encounter classes: 9,19 Date processed: 6/23/94  
Based on FAA Technical Center data of: 6/20/94  
Total TCAS-TCAS runs for both points of view : 279616  
Total incorrectly labelled RAs : 320

Class		9	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAs/ runs	(%)	82.91	70.54	73.41	77.33	78.12	70.81
Crossing RAs/ RAs	(%)	29.50	24.84	29.34	27.23	31.66	27.33
Crossing RAs/ runs	(%)	24.46	17.52	21.53	21.06	24.73	19.35
Cr. RA NMACs/ cross RAs (%)		0.03	0.70	0.97	0.05	0.13	0.67
Cr. RA NMACs/ NMACs*	(%)	50.00	56.67	82.86	37.50	90.00	69.23
NMACs*/ runs	(%)	0.01	0.22	0.25	0.03	0.04	0.19
Avg warning time**	(sec)	17.34	15.71	17.80	16.87	18.30	16.75
Avg alt sep at CPA*	(ft)	843.44	750.35	809.60	806.89	852.21	783.27

Class		19	TCAS - TCAS		Both Responding		
	6.02 only	6.04 only	6.04A only	6.02 / 6.04	6.02 / 6.04A	6.04 / 6.04A	
RAs/ runs	(%)	84.76	71.04	70.59	79.99	79.71	70.66
Crossing RAs/ RAs	(%)	39.68	32.95	22.94	35.84	32.19	28.92
Crossing RAs/ runs	(%)	33.63	23.41	16.19	28.67	25.66	20.43
Cr. RA NMACs/ cross RAs (%)		6.83	11.58	2.52	8.47	5.42	7.90
Cr. RA NMACs/ NMACs*	(%)	100.00	100.00	100.00	100.00	99.58	99.64
NMACs*/ runs	(%)	2.30	2.71	0.41	2.43	1.40	1.62
Avg warning time**	(sec)	21.70	19.80	20.68	21.31	21.82	20.20
Avg alt sep at CPA*	(ft)	937.48	863.74	970.62	917.05	972.81	911.84

\* NMACs and average alt. sep. at CPA are based on simulation truth

\*\* Average warning time includes negative times (ie, RA occurs after CPA)

## APPENDIX J

### NMACS UNIQUE TO VERSION 6.04A

#### TABLES 7.4 AND 9.4

##### 1. TABLE 7.4 NMACS

The plot in Figure J-1 is representative of the Class 7 encounters in which version 6.04a induces an NMAC and version 6.04 resolves the encounter. The plot shows Aircraft 1 and Aircraft 2 performance when both are 6.04a-equipped. The associated encounter summaries for versions 6.02, 6.04, and 6.04a are given in Figure J-2.

This encounter is an example of 6.04a modification 2, described in Section 4.1. Here, Aircraft 1 is the first to detect the threat, selecting a crossing RA against Aircraft 2. However, the altitude separation test comes into play, holding off Aircraft 1's issuance of a crossing RA until the aircraft are within 600 feet. Meanwhile, Aircraft 2, seeing the geometry slightly differently, selects and communicates a non-crossing RA to Aircraft 1. Aircraft 1 must comply with the received intent and thus also selects a non-crossing RA. The real problem is that the non-crossing RA is not a good choice. By the time that Aircraft 2 can respond to the RA, it has already achieved a substantial climb rate toward Aircraft 1 and cannot arrest its rate in time to achieve separation in the opposite direction.

In contrast, with the version 6.04 logic, there is nothing to hold off Aircraft 1's original selection of the crossing RA. Here, the crossing RA is consistent with and reinforces the strong maneuver being executed by Aircraft 2, and adequate separation can be achieved.

As stated in Section 5.2.2, although this encounter is technically labeled an induced NMAC with 6.04a, the encounter without TCAS (separation of 250 feet) is hardly benign. Both aircraft are flying level, separated by less than 1000 feet. Twenty seconds before closest approach, the lower aircraft suddenly accelerates strongly and climbs through the other aircraft's altitude. This is not an encounter that would occur deliberately in the airspace. By delaying issuing the crossing RA, the 6.04a logic is betting that the lower aircraft is more likely to level-off than to cross through the higher aircraft's altitude. Although that is not true for this encounter, it is still generally considered the proper choice.

##### 2. TABLE 9.4 NMACS

The plot in Figure J-3 is representative of the Class 9 encounters in which version 6.04a induces an NMAC and version 6.04 resolves the encounter. The plot shows Aircraft 1 and Aircraft 2 performance when both are 6.04a-equipped. The associated encounter summaries for versions 6.02, 6.04, and 6.04a are given in Figure J-4.

This encounter is similar to the Seattle encounter, except that the aircraft plan to level-off 250 feet apart, instead of 1000 feet. Here again, the 6.04a modification 2 comes into play, with both aircraft selecting crossing RAs and the altitude separation test causing the RAs to be deferred until the aircraft come within 850 feet. In all three versions of the logic, crossing RAs are selected. In versions 6.02 and 6.04, however, the altitude separation test does not apply in this geometry; thus, there is no deferral of the RA, and the extra time allows the aircraft to achieve adequate vertical separation. In version 6.04a, the RA simply comes too late to be effective. Again (as in the Table 7.4 example above), by delaying issuing the crossing RA, the 6.04a logic is betting that the lower aircraft will level-off at least 1000 feet below the higher aircraft. Although that is not true for this encounter, it is still generally considered the proper choice.

One item of note for the version 6.04a logic in this encounter is the long interval between the appearance of the potential RA (time=34 seconds for both aircraft) and the issuance of the RA

(time=49 and 51 seconds for Aircraft 2 and 1, respectively). This is due to a sensitivity level change in the middle of the encounter. Both aircraft detect a threat at time=34 seconds, but while the RA is being delayed (Aircraft 1: defer display (coordination), Aircraft 2: altitude separation test), the sensitivity level drops from 5 to 4, thereby increasing the threat detection thresholds. The threat status then drops back to TA for both aircraft. The sensitivity level 4 thresholds are crossed at time=40 seconds for both aircraft, but the issuance of the RAs is then delayed by the altitude separation test. Note that there is a proposal for the Change 7 TCAS logic to not allow the sensitivity level to change during an encounter.



# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL717XZL.605; REIT Number=2014

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)

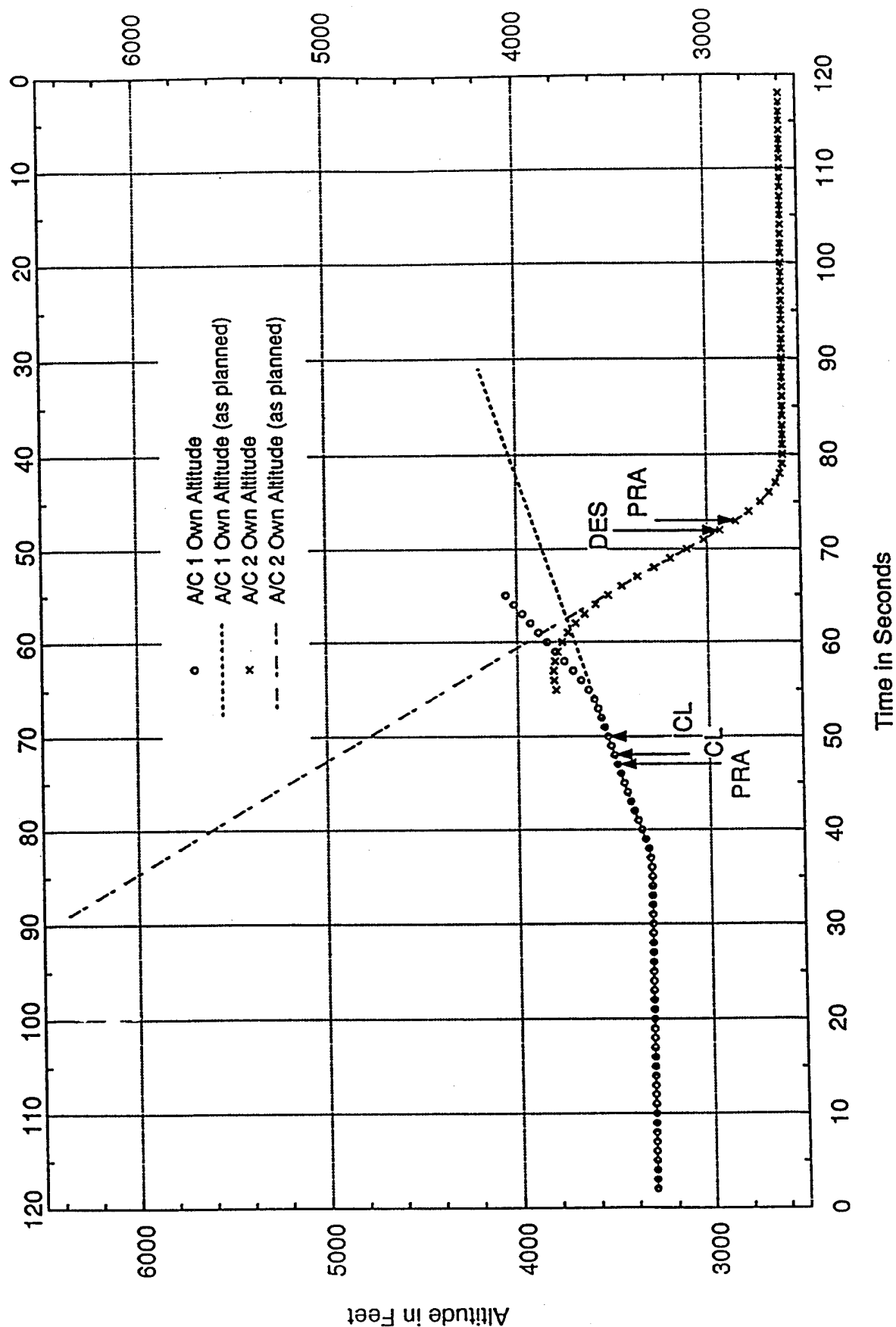


Figure J-1. Encounter Summary - Aircraft Altitudes. Data File Name=LL717XZL.605; REIT Number=2014, SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)

2014 6.02 RL VS 6.02 RH 7 658.58 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUUV = 25.0 ALIM = 400.0

-250.0 (0.0,1000.0) (0.0,5000.0) 0.15 0.35 -25.0 -20.0 3700.0

A/C1: CL717CF,2162022 |TAUR | LD5 @34 [NXRA] | LD1 @44 | LD2 @56

A/C2:CL717EF2,2262122 |TAUR | LC5 @34 [NXRA] | LC2 @45

2014 6.04 RL VS 6.04 RH 7 -475.41 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUUV = 20.0 ALIM = 300.0

-250.0 (0.0,1000.0) (0.0,5000.0) 0.15 0.35 -25.0 -20.0 3700.0

A/C1: CL717O,2164033 |TAUV | DES @47 [XRA]

A/C2:CL717OP2,2264133 |TAUV | CL @47 [XRA] | ICL @49

2014 6.04A RL VS 6.04A RH 7 94.30 NON\_CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUUV = 20.0 ALIM = 300.0

-250.0 (0.0,1000.0) (0.0,5000.0) 0.15 0.35 -25.0 -20.0 3700.0

A/C1: CL717WZ,2165044 |TAUV | POTRA @47 (6FT) | CL @48 [NXRA] | ICL @50

A/C2:CL717YZ2,2265144 |TAUV | POTRA @47 (DFD) | DES @48 [NXRA]

Figure J-2. Encounter Summaries for 6.02, 6.04, and 6.04a.

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL919YZH.605; REIT Number=1509

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)

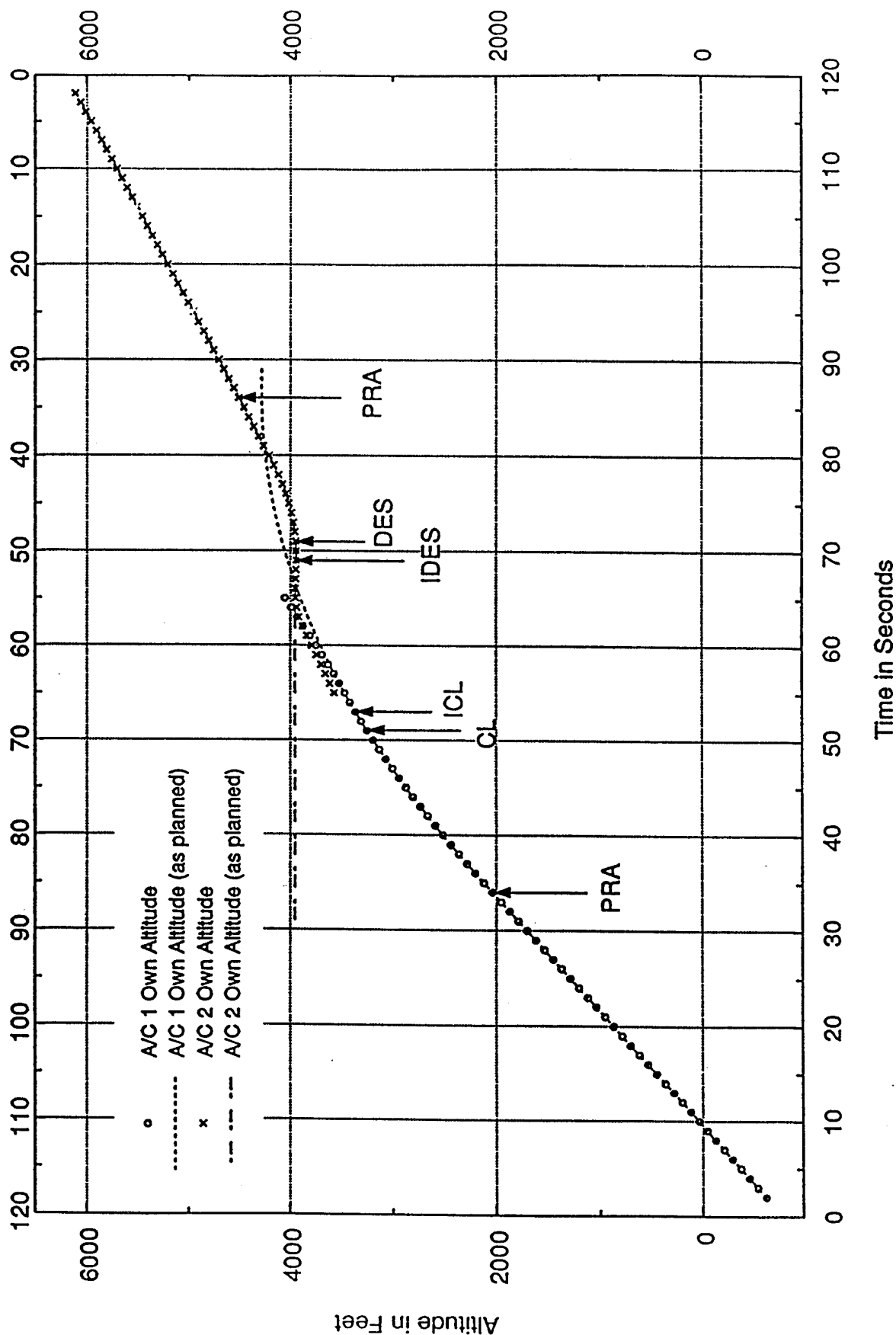


Figure J-3. Encounter Summary - Aircraft Altitudes, Data File Name=LL919YZH.605; REIT Number=1509, SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)

1509	6.02	RH	VS	6.02	RL	9	898.37	CROSSING_ENCOUNTER
SL = 5	ZTHR =	750.0	TAUR =	25.0	TAUV =	25.0	ALIM =	400.0
-250.0	(5000.0,0.0)	(-3000.0,0.0)	-0.05	0.15	-25.0	-20.0	3700.0	
A/C1:	CL919CF,2162122	PVMD		CL	@38	[XRA]		LD2 @57
A/C2:	CL919EH2,2262022	PVMD		DES	@35	[XRA]		IDES @54
1509	6.04	RH	VS	6.04	RL	9	312.08	CROSSING_ENCOUNTER
SL = 4	ZTHR =	600.0	TAUR =	20.0	TAUV =	20.0	ALIM =	300.0
-250.0	(5000.0,0.0)	(-3000.0,0.0)	-0.05	0.15	-25.0	-20.0	3700.0	
A/C1:	CL919OR,2164133	PVMD		CL	@45	[XRA]		ICL @47   CL @57
A/C2:	CL919OR2,2264033	PVMD		DES	@44	[XRA]		IDES @50
1509	6.04A	RH	VS	6.04A	RL	9	-27.82	CROSSING_ENCOUNTER
SL = 5	ZTHR =	600.0	TAUR =	25.0	TAUV =	25.0	ALIM =	300.0
-250.0	(5000.0,0.0)	(-3000.0,0.0)	-0.05	0.15	-25.0	-20.0	3700.0	
A/C1:	CL919WZ,2165144	TAUR		POTRA @34	(DFD)		CL @51 [XRA]	ICL @53
A/C2:	CL919YZ2,2265044	TAUR		POTRA @34	(6FT)		DES @49 [XRA]	IDES @51

Figure J-4. Encounter Summaries for 6.02, 6.04, and 6.04a.

**APPENDIX K**  
**CLASS WEIGHTS<sup>2</sup>**

Class	Weight
1	0.0197
2	0.0004
3	0.0033
4	0.0145
5	0.0025
6	0.0029
7	0.0002
8	0.0005
9	0.0001
10+0	0.3973
11	0.1929
12	0.0759
13	0.1081
14	0.1167
15	0.0205
16	0.0256
17	0.0019
18	0.0094
19	0.0074
Total:	1.0000

---

<sup>2</sup> McLaughlin, M.P. and A.D. Zeitlin, "Safety Study of TCAS II for Logic Version 6.04a." The MITRE Corporation, McLean, VA, MTR 93W0000234, November 1993.

## **APPENDIX L**

### **30 REPRESENTATIVE NMAC ENCOUNTERS**

19 Jul 1994

TOTAL 6.04a NMACs AND CHARACTERISTIC 6.04a NMAC GROUPS PER CLASS AND TABLE  
(Table 3 - Unresolved NMACs; Table 4 - Induced NMACs)

Cls	Tbl	Characteristic Data File and REIT	NMACs in Grp	% of Tbl	NMACs in Tbl	# of Enc.	% of Enc.
0	3	Total NMACs for Table=			0	16	0.0
0	4	Total NMACs for Table=			0	20	0.0
1	3	Total NMACs for Table=			0	72	0.0
1	4	Total NMACs for Table=			0	304	0.0
2	3	Total NMACs for Table= LL212OZL.605 0123	5	100.0%	5	864	0.58%
2	4	Total NMACs for Table= LL212OZL.605 1196	52	100.0%	52	3032	1.72%
3	3	Total NMACs for Table=			0	736	0.0
3	4	Total NMACs for Table=			0	2416	0.0
4	3	Total NMACs for Table=			0	120	0.0
4	4	Total NMACs for Table=			0	608	0.0
5	3	Total NMACs for Table=			0	1580	0.0
5	4	Total NMACs for Table= LL515WZL.605 1006 LL515WZL.605 1195 LL515WZL.605 1952	5 4 17	19.2% 15.4% 65.4%	26	7488	0.35%
6	3	Total NMACs for Table= LL616WZL.605 0081 LL616WZL.605 5863	4 10	28.6% 71.4%	14	1728	0.81%
6	4	Total NMACs for Table= LL616WZL.605 4612	12	100.0	12	7384	0.16%
7	3	Total NMACs for Table= LL717XZL.605 2538	4	100.0	4	2416	0.17%
7	4	Total NMACs for Table= LL717XZL.605 2014 LL717XZL.605 8982	5 191	2.6% 97.4%	196	9988	1.96%
8	3	Total NMACs for Table= LL818YZL.605 0641 LL818YZL.605 7305 LL818YZL.605 8712	4 7 19	13.3% 23.3% 63.3%	30	2592	1.16%
8	4	Total NMACs for Table= LL818YZL.605 1385 LL818YZL.605 2655 LL818YZL.605 3615 LL818YZH.605 4970	27 152 4 5	14.4% 80.9% 2.1% 2.7%	188	10044	1.87%

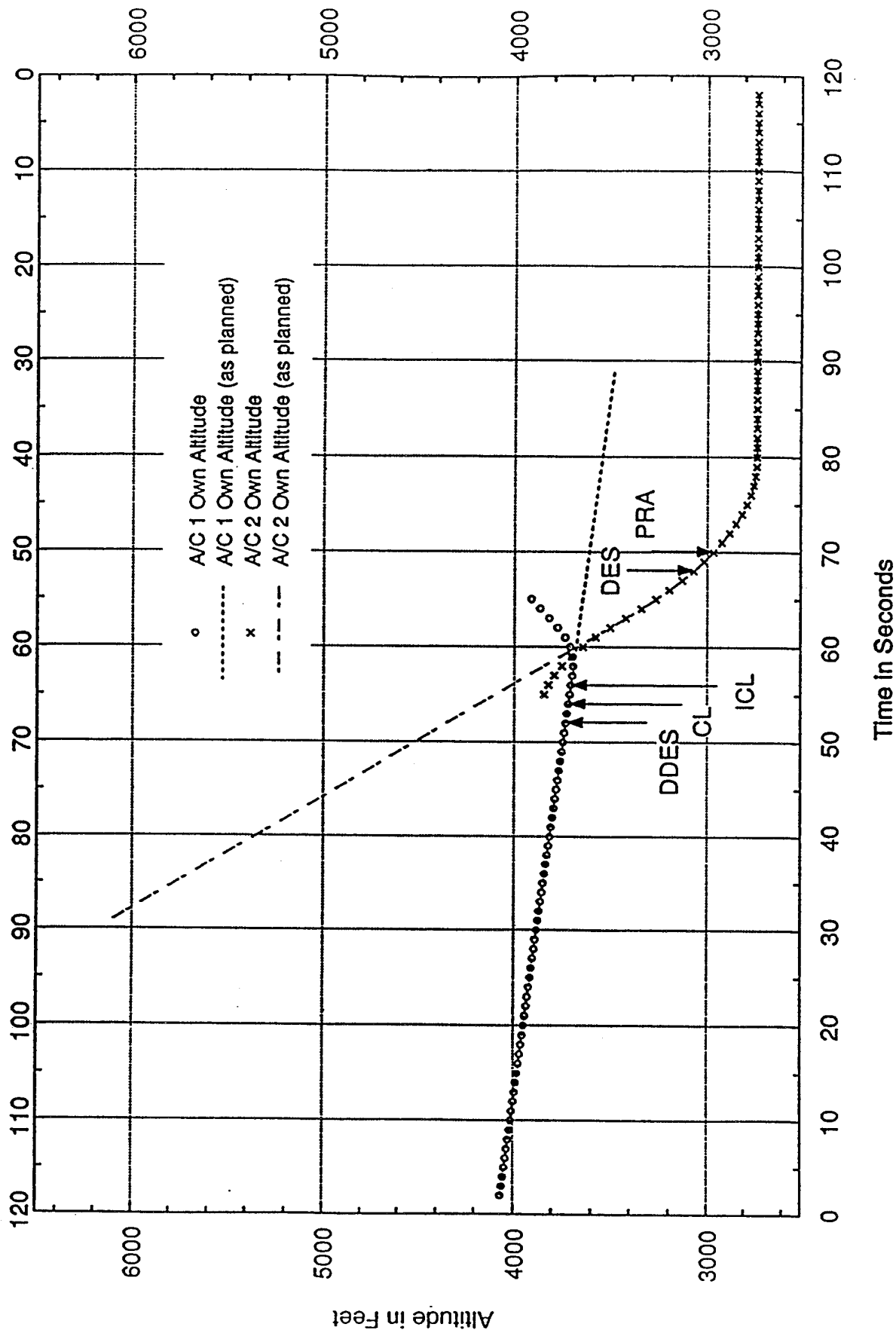
Cls	Tbl	Characteristic Data File and REIT	NMACs in Grp	% of Tbl	NMACs in Tbl	# of Enc.	% of Enc.
9	3	Total NMACs for Table=			0	1158	0.0
9	4	Total NMACs for Table=			18	5808	0.31%
		LL919YZH.605	1509	14	77.8%		
		LL919YZH.605	3523	4	22.2%		
10	3	Total NMACs for Table=			0	8	0.0
10	4	Total NMACs for Table=			0	124	0.0
11	3	Total NMACs for Table=			0	0	0.0
11	4	Total NMACs for Table=			0	128	0.0
12	3	Total NMACs for Table=			0	0	0.0
12	4	Total NMACs for Table=			1	2152	0.05%
		LL212OZL.605	1421	1	100.0		
13	3	Total NMACs for Table=			0	128	0.0
13	4	Total NMACs for Table=			4	4496	0.09%
		LL313SZL.605	1614	4	100.0		
14	3	Total NMACs for Table=			0	24	0.0
14	4	Total NMACs for Table=			0	256	0.0
15	3	Total NMACs for Table=			0	148	0.0
15	4	Total NMACs for Table=			21	2880	0.73%
		LL515WZL.605	4283	18	85.7%		
		LL515WZL.605	5543	3	14.3%		
16	3	Total NMACs for Table=			0	0	0.0
16	4	Total NMACs for Table=			1	2984	0.03%
		LL616WZL.605	2491	1	100.0		
17	3	Total NMACs for Table=			0	176	0.0
17	4	Total NMACs for Table=			14	5564	0.25%
		LL717XZL.605	2732	14	100.0		
18	3	Total NMACs for Table=			0	0	0.0
18	4	Total NMACs for Table=			17	5508	0.31%
		LL818YZL.605	1520	12	70.6%		
		LL818YZH.605	3978	5	29.4%		
19	3	Total NMACs for Table=			0	570	0.0
19	4	Total NMACs for Table=			36	8016	0.45%
		LL919YZH.605	2883	11	30.6%		
		LL919YZH.605	7162	25	69.4%		
TOTAL					639		



# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL212OZL.605; REIT Number=123

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



123	6.02	RL VS 6.02 RH	2	238.85	NON_CROSSING_ENCOUNTER
SL = 5	ZTHR = 750.0	TAUR = 25.0	TAUV = 25.0	ALIM = 400.0	
0.0	(-400.0, -400.0)	(0.0, 5000.0)	0.00	0.15	0.0 -20.0 3680.0
A/C1: CL212CH, 2162022  TAUV   DDES @50 [NXRA]   CL @52					
A/C2: CL212EJ2, 2262122  TAUV   POTRA @48 (DFD)   DES @50 [NXRA]					
123	6.04	RL VS 6.04 RH	2	82.53	NON_CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0	
0.0	(-400.0, -400.0)	(0.0, 5000.0)	0.00	0.15	0.0 -20.0 3680.0
A/C1: CL212OT, 2164033  TAUV   DDES @52 [NXRA]   CL @54   ICL @56					
A/C2: CL212MR2, 2264133  TAUV   POTRA @50 (DFD)   DES @52 [NXRA]					
123	6.04A	RL VS 6.04A RH	2	82.53	NON_CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0	
0.0	(-400.0, -400.0)	(0.0, 5000.0)	0.00	0.15	0.0 -20.0 3680.0
A/C1: CL212UZ, 2165044  TAUV   DDES @52 [NXRA]   CL @54   ICL @56					
A/C2: CL212UZ2, 2265144  TAUV   POTRA @50 (DFD)   DES @52 [NXRA]					

Mitre encounter Class : 2                      Reit number : 123

NMAC Characterization

100% had pattern shown on attached plot	
100% had planned separation =	0      ft
AC1 rates :	0, +/- 400      fpm
AC2 rates :	5000      fpm
AC1 accel :	0.0      g
AC2 accel :	0.15      g
AC2 accel time : CPA:	20      sec

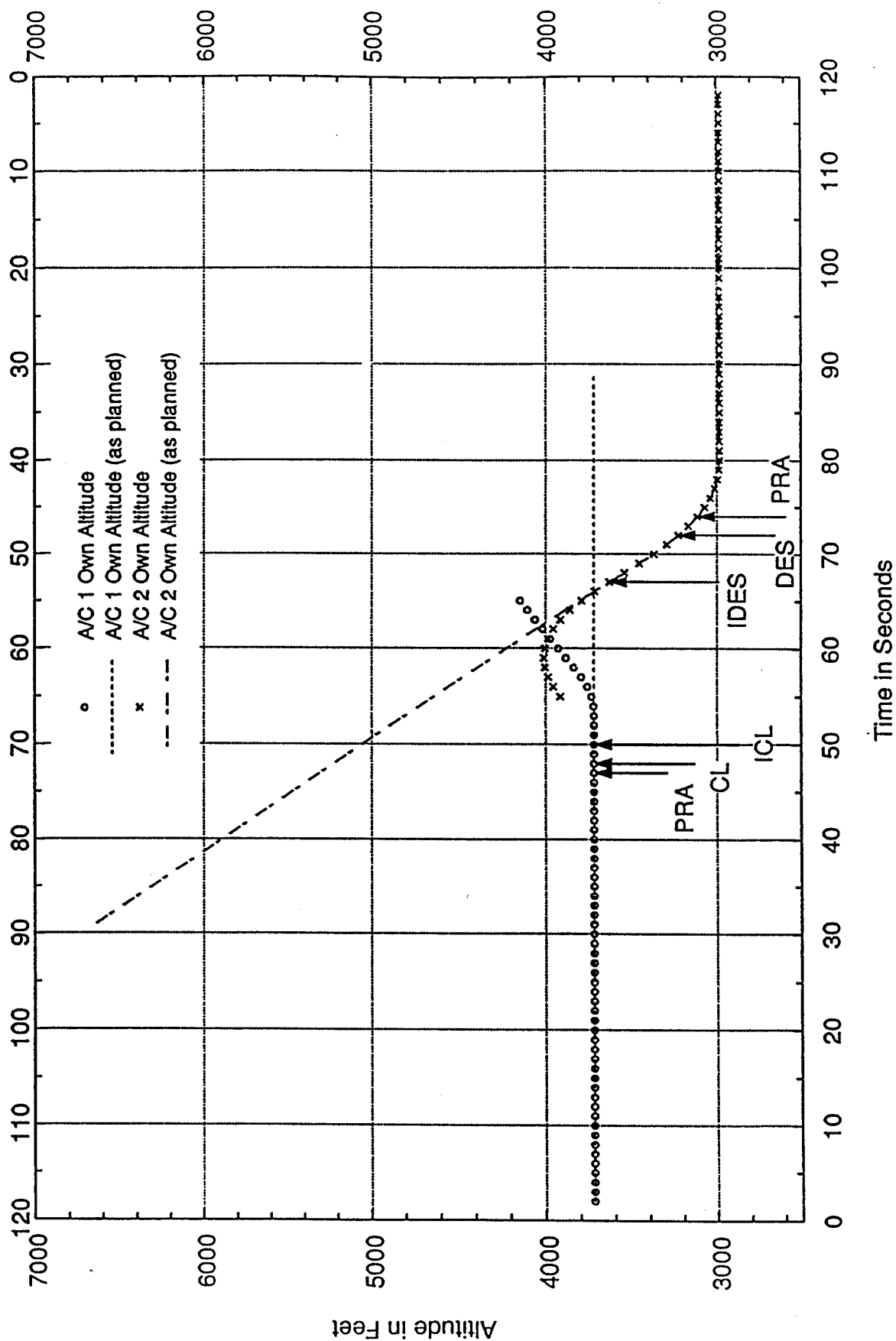
Performance Statistics (relate to whole class)

97%	of RAs were non-crossing
98%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL212OZL.605; REIT Number=1196

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1196	6.02	RL	VS	6.02	RH	2	518.60	NON_CROSSING_ENCOUNTER
SL = 5	2THR =	750.0	TAUR =	25.0	TAUV =	25.0	ALIM =	400.0
-500.0	(0.0,0.0)	(0.0,5000.0)	0.00	0.25	0.0	-20.0	3720.0	
A/C1:	CL212CH,2162022	TAUR		LD5	Q34	[NXRA]		LD1 Q46   LD5 Q49
A/C2:	CL212EJ2,2262122	TAUR		LC5	Q34	[NXRA]		LC1 Q51
1196	6.04	RL	VS	6.04	RH	2	-48.15	NON_CROSSING_ENCOUNTER
SL = 4	2THR =	600.0	TAUR =	20.0	TAUV =	20.0	ALIM =	300.0
-500.0	(0.0,0.0)	(0.0,5000.0)	0.00	0.25	0.0	-20.0	3720.0	
A/C1:	CL212OT,2164033	RELZ		POTRA	Q47	(LVW)		CL Q48 [NXRA]   ICL Q50
A/C2:	CL212MR2,2264133	RELZ		POTRA	Q46	(DFD)		DES Q48 [NXRA]   IDES Q53
1196	6.04A	RL	VS	6.04A	RH	2	-48.15	NON_CROSSING_ENCOUNTER
SL = 4	2THR =	600.0	TAUR =	20.0	TAUV =	20.0	ALIM =	300.0
-500.0	(0.0,0.0)	(0.0,5000.0)	0.00	0.25	0.0	-20.0	3720.0	
A/C1:	CL212UZ,2165044	RELZ		POTRA	Q47	(LVW)		CL Q48 [NXRA]   ICL Q50
A/C2:	CL212UZ2,2265144	RELZ		POTRA	Q46	(DFD)		DES Q48 [NXRA]   IDES Q53

Mitre encounter Class : 2      Reit number : 1196

NMAC Characterization

100% had pattern shown on attached plot	ft
60% had planned separation =	- 500
AC1 rates:	0, +/- 400
96% had AC2 rate:	5000
AC1 accel:	0.0
94% had AC2 accel:	0.25 or 0.35
96% had AC2 accel time CPA:	20
	sec

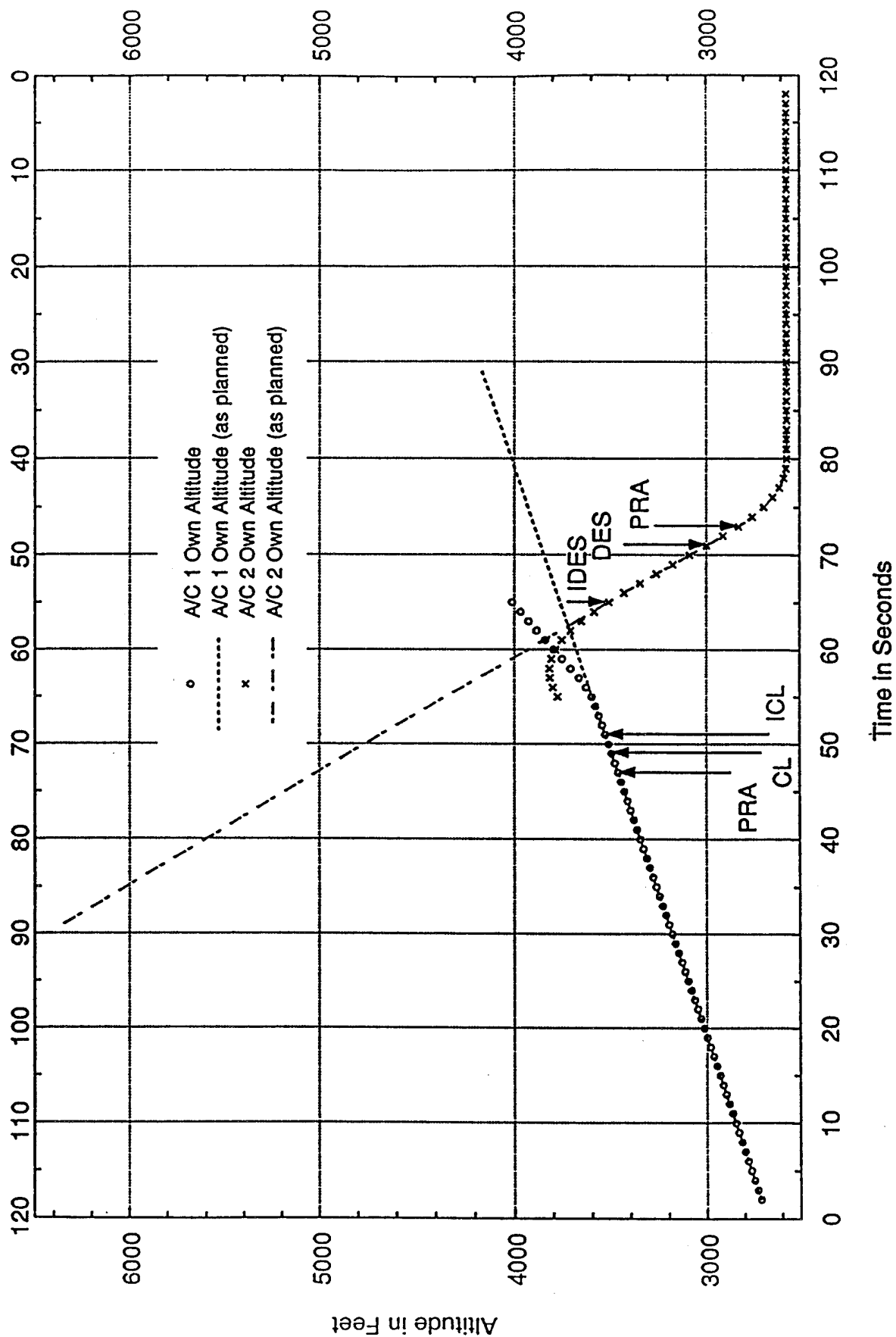
Performance Statistics (relate to whole class)

98%	of RAs were non-crossing
98%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL515WZL.605; REIT Number=1006

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1006 6.02 RL VS 6.02 RH 5 272.99 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -250.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 3680.0  
 A/C1: CL515CE,2162022 |PVMD | CL 046 [NXRA]| ICL 049  
 A/C2:CL515EG2,2262122 |RELZ | POTRA 045 (DFD) | DES 046 [NXRA]

1006 6.04 RL VS 6.04 RH 5 31.50 NON\_CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 -250.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 3680.0  
 A/C1: CL515OQ,2164033 |TAUV | POTRA 047 (VTT) | CL 049 [NXRA]| ICL 051  
 A/C2:CL515MO2,2264133 |TAUV | POTRA 047 (DFD) | DES 049 [NXRA]| IDES 055

1006 6.04A RL VS 6.04A RH 5 31.50 NON\_CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 -250.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 3680.0  
 A/C1: CL515XZ,2165044 |TAUV | POTRA 047 (VTT) | CL 049 [NXRA]| ICL 051  
 A/C2:CL515XZ2,2265144 |TAUV | POTRA 047 (DFD) | DES 049 [NXRA]| IDES 055



Mitre encounter Class : 5      Reit number : 1006

NMAC Characterization

20% had pattern shown on attached plot  
100% had planned separation = 250 ft  
AC1 rates : 1000 fpm  
AC2 rates : 5000 fpm  
AC1 accel : 0.0 g  
AC2 accel : 0.15, 0.25, 0.35 g  
80% had AC2 accel time CPA: 20 sec

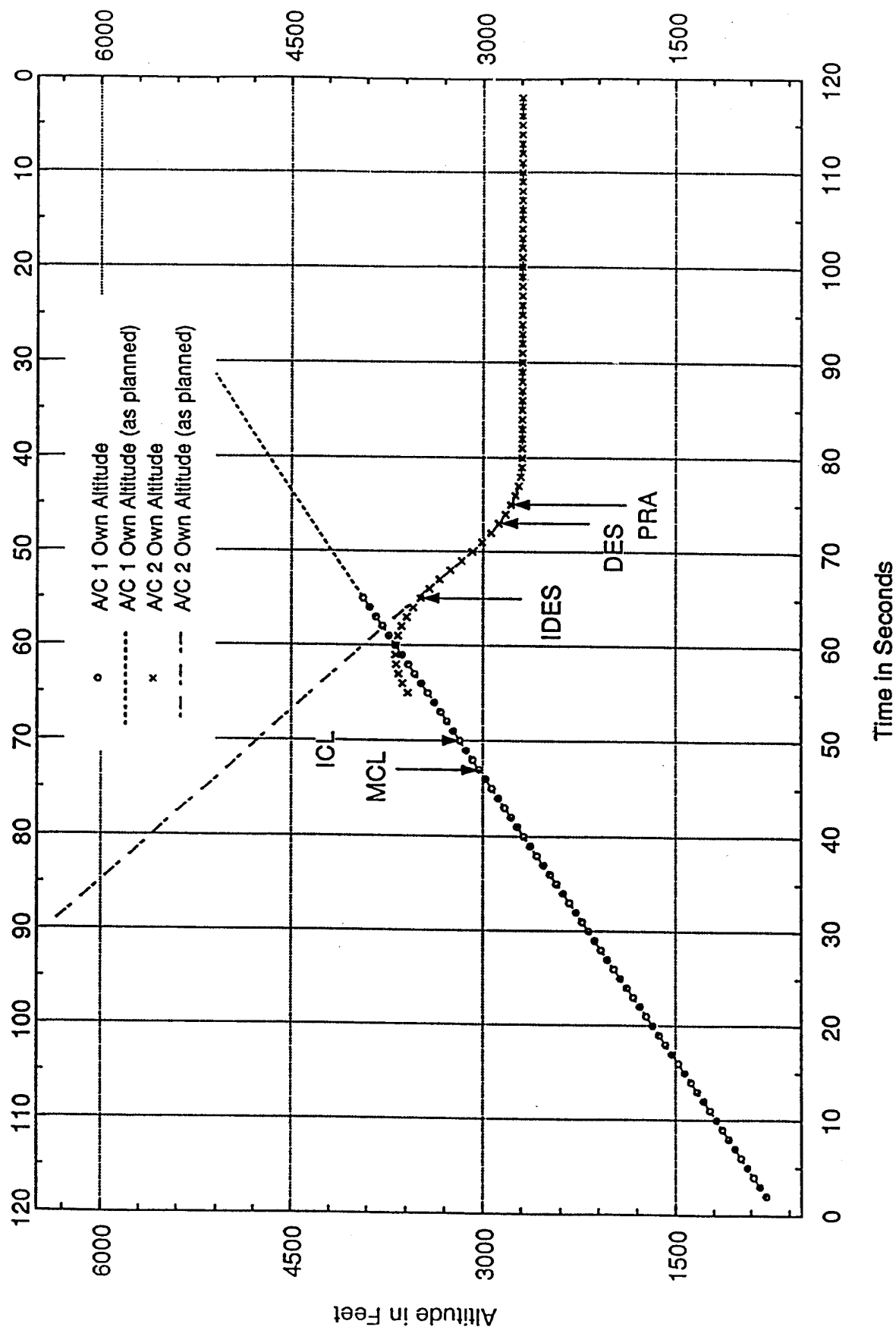
Performance Statistics (relate to whole class)

95% of RAs were non-crossing  
98% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL515WZL.605; REIT Number=1195

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1195 6.02 RL VS 6.02 RH 5 206.39 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUW = 25.0 ALIM = 400.0  
 -250.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.25 0.0 -20.0 3680.0  
 A/C1: CL515CE,2162022 |PVMD | POTRA @44 (FRM) | MCL @45 [NXRA] | ICL @50  
 A/C2:CL515EG2,2262122 |PVMD | POTRA @43 (DFD) | DES @45 [NXRA] | IDES @54

1195 6.04 RL VS 6.04 RH 5 21.86 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 -250.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.25 0.0 -20.0 3680.0  
 A/C1: CL515OQ,2164033 |PVMD | MCL @47 [NXRA] | ICL @50  
 A/C2:CL515MO2,2264133 |PVMD | POTRA @45 (DFD) | DES @47 [NXRA] | IDES @55

1195 6.04A RL VS 6.04A RH 5 21.86 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 -250.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.25 0.0 -20.0 3680.0  
 A/C1: CL515XZ,2165044 |PVMD | MCL @47 [NXRA] | ICL @50  
 A/C2:CL515XZ2,2265144 |PVMD | POTRA @45 (DFD) | DES @47 [NXRA] | IDES @55

Mitre encounter Class : 5      Reit number : 1195

NMAC Characterization

15% had pattern shown on attached plot		
100% had planned separation =	250	ft
AC1 rates :	3000	fpm
AC2 rates :	5000	fpm
AC1 accel :	0.0	g
AC2 accel :	0.25, 0.35	g
AC2 accel time : CPA:	20	sec

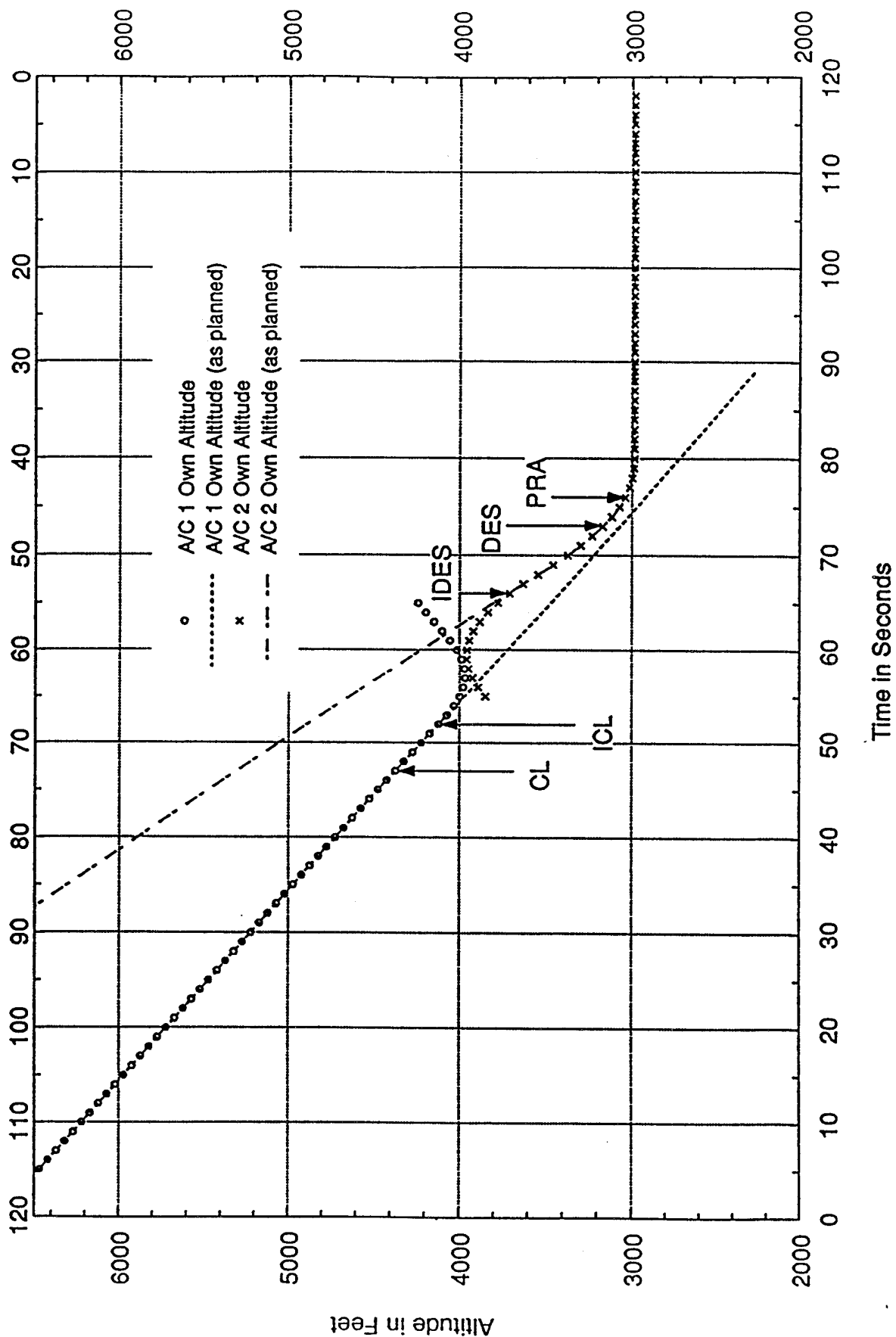
Performance Statistics (relate to whole class)

95%	of RAs were non-crossing
98%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL515WZL.605; REIT Number=1952

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1952	6.02	RL VS 6.02	RH	5	387.83	NON_CROSSING_ENCOUNTER
SL = 5	ZTHR = 750.0	TAUR = 25.0	TAUV = 25.0	ALIM = 400.0		
-500.0	(-3000.0, -3000.0)	(0.0, 5000.0)	0.00	0.25	0.0	-20.0 3720.0
A/C1:	CL515CE, 2162022	TAUV   CL	@45	[NXRA]   ICL	@52	
A/C2:	CL515EG2, 2262122	TAUV   POTRA @44	(DFD)   DES	@45	[NXRA]	
1952	6.04	RL VS 6.04	RH	5	98.41	NON_CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0		
-500.0	(-3000.0, -3000.0)	(0.0, 5000.0)	0.00	0.25	0.0	-20.0 3720.0
A/C1:	CL515OQ, 2164033	TAUV   CL	@47	[NXRA]   ICL	@52	
A/C2:	CL515MO2, 2264133	TAUV   POTRA @44	(DFD)   DES	@47	[NXRA]   IDES	@54
1952	6.04A	RL VS 6.04A	RH	5	98.41	NON_CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0		
-500.0	(-3000.0, -3000.0)	(0.0, 5000.0)	0.00	0.25	0.0	-20.0 3720.0
A/C1:	CL515XZ, 2165044	TAUV   CL	@47	[NXRA]   ICL	@52	
A/C2:	CL515XZ2, 2265144	TAUV   POTRA @44	(DFD)   DES	@47	[NXRA]   IDES	@54

Mitre encounter Class : 5                      Reit number : 1952

NMAC Characterization

65% had pattern shown on attached plot		
planned separation =	-250, -500, -750	ft
AC1 rates :	(76%)1000, (24%)3000	fpm
AC2 rates :	(94%)5000, (6%)3000	fpm
AC1 accel :	0.0	g
AC2 accel : (6%) 0.15, (70%) 0.25, (24%) 0.35		g
AC2 accel time : CPA:	(94%)20 or (6%) 25	sec

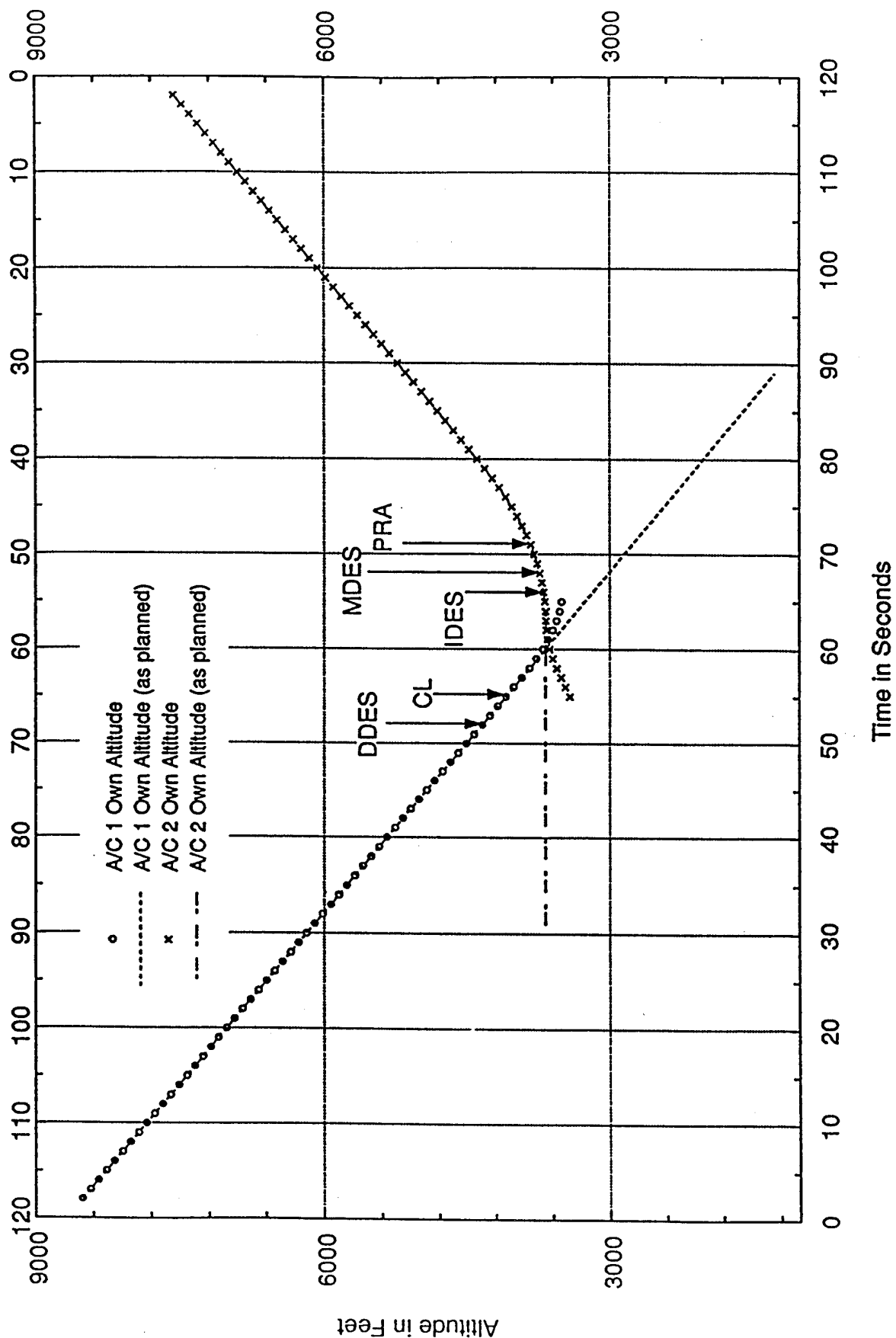
*Performance Statistics (relate to whole class)*

95% of RAs were non-crossing  
98% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL616WZL.605; REIT Number=0081

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)





81 6.02 RL VS 6.02 RH 6 171.03 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 0.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -20.0 3680.0  
 A/C1: CL616CE,2162022 |RELZ | LD2 051 [NXRA] | CL 052  
 A/C2:CL616EG2,2262122 |TAUV | POTRA 049 (DFD) | MDES 051 [NXRA] | IDES 053

81 6.04 RL VS 6.04 RH 6 90.58 NON\_CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 0.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -20.0 3680.0  
 A/C1: CL616OQ,2164033 |TAUV | DDES 052 [NXRA] | CL 055  
 A/C2:CL616MO2,2264133 |TAUV | POTRA 049 (VTT) | MDES 052 [NXRA] | IDES 054

81 6.04A RL VS 6.04A RH 6 90.58 NON\_CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 0.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -20.0 3680.0  
 A/C1: CL616XZ,2165044 |TAUV | DDES 052 [NXRA] | CL 055  
 A/C2:CL616XZ2,2265144 |TAUV | POTRA 049 (VTT) | MDES 052 [NXRA] | IDES 054

Mitre encounter Class : 6      Reit number : 81

NMAC Characterization

29% had pattern shown on attached plot	
100% had planned separation =	0      ft
AC1 rates :	-5000      fpm
AC2 rates :	-5000      fpm
AC1 accel :	0.0      g
AC2 accel :	0.15      g
AC2 accel time :CPA:	20      sec

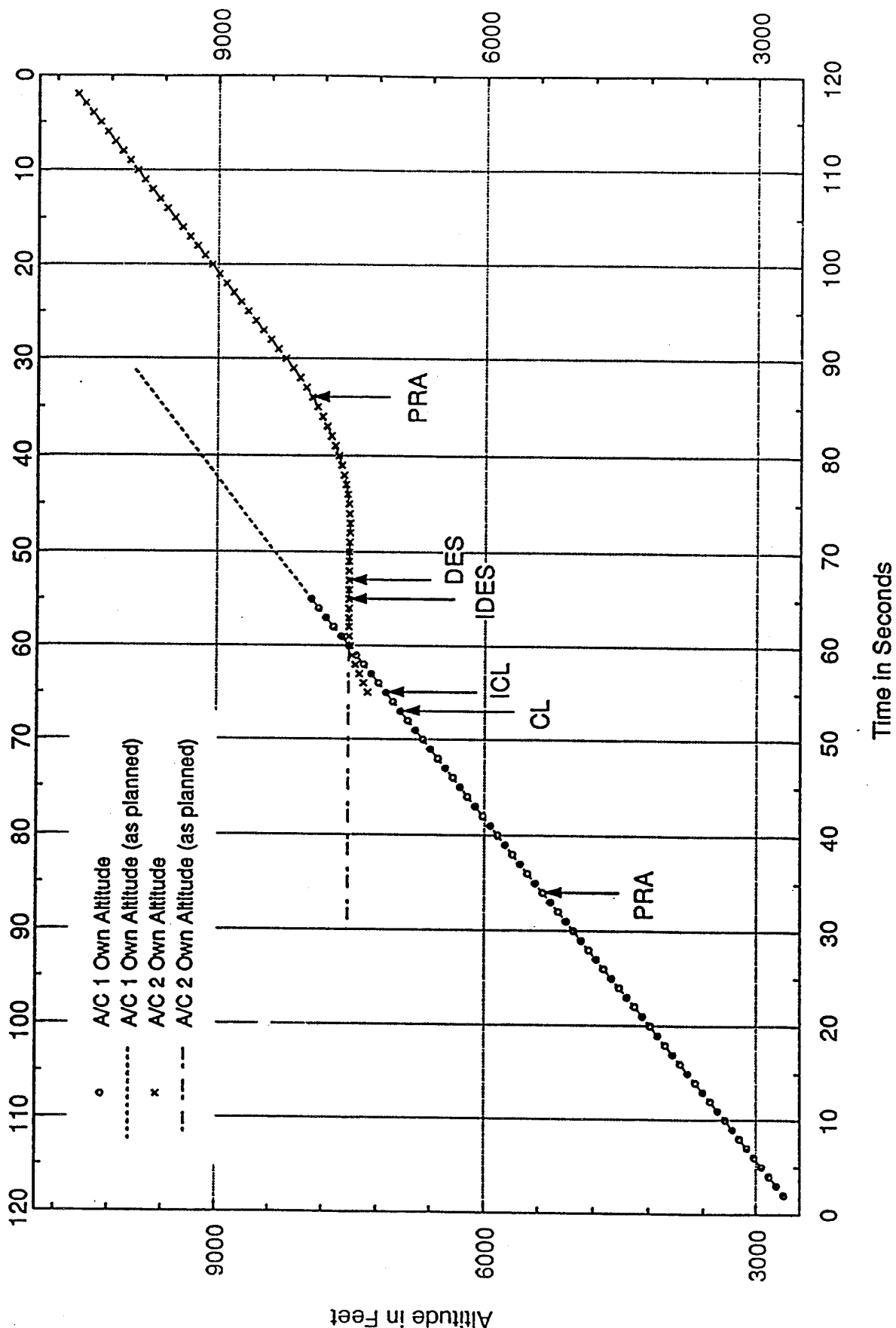
Performance Statistics (relate to whole class)

82%	of RAs were non-crossing
63%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL616WZL.605; REIT Number=5863

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



5863 6.02 RL VS 6.02 RH 6 469.11 CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0

0.0 (5000.0,5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -30.0 7520.0

A/C1: CL616CE,2162022 |PVMD | CL 043 [XRA] | MCL 058

A/C2:CL616EG2,2262122 |PVMD | POTRA 039 (DFD) | DES 042 [XRA] | IDES 044

5863 6.04 RL VS 6.04 RH 6 422.90 CROSSING\_ENCOUNTER

SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0

0.0 (5000.0,5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -30.0 7520.0

A/C1: CL616OQ,2164033 |PVMD | CL 043 [XRA] | MCL 058

A/C2:CL616MO2,2264133 |PVMD | POTRA 041 (DFD) | DES 043 [XRA] | IDES 045

5863 6.04A RL VS 6.04A RH 6 22.51 CROSSING\_ENCOUNTER

SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 300.0

0.0 (5000.0,5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -30.0 7520.0

A/C1: CL616XZ,2165044 |TAUR | POTRA 034 (6FT) | CL 053 [XRA] | ICL 055

A/C2:CL616XZ2,2265144 |TAUR | POTRA 034 (6FT) | DES 053 [XRA] | IDES 055

Mitre encounter Class : 6      Reit number : 5863

NMAC Characterization

71% had pattern shown on attached plot	
100% had planned separation =	0
AC1 rates :	5000
AC2 rates : (10%) -3000, (90%)	-5000
AC1 accel :	0.0
AC2 accel : (80%) 0.15, (20%)	0.35
AC2 accel time : CPA:	20, 25, or 30
	ft
	fpm
	fpm
	g
	g
	sec (evenly distributed)

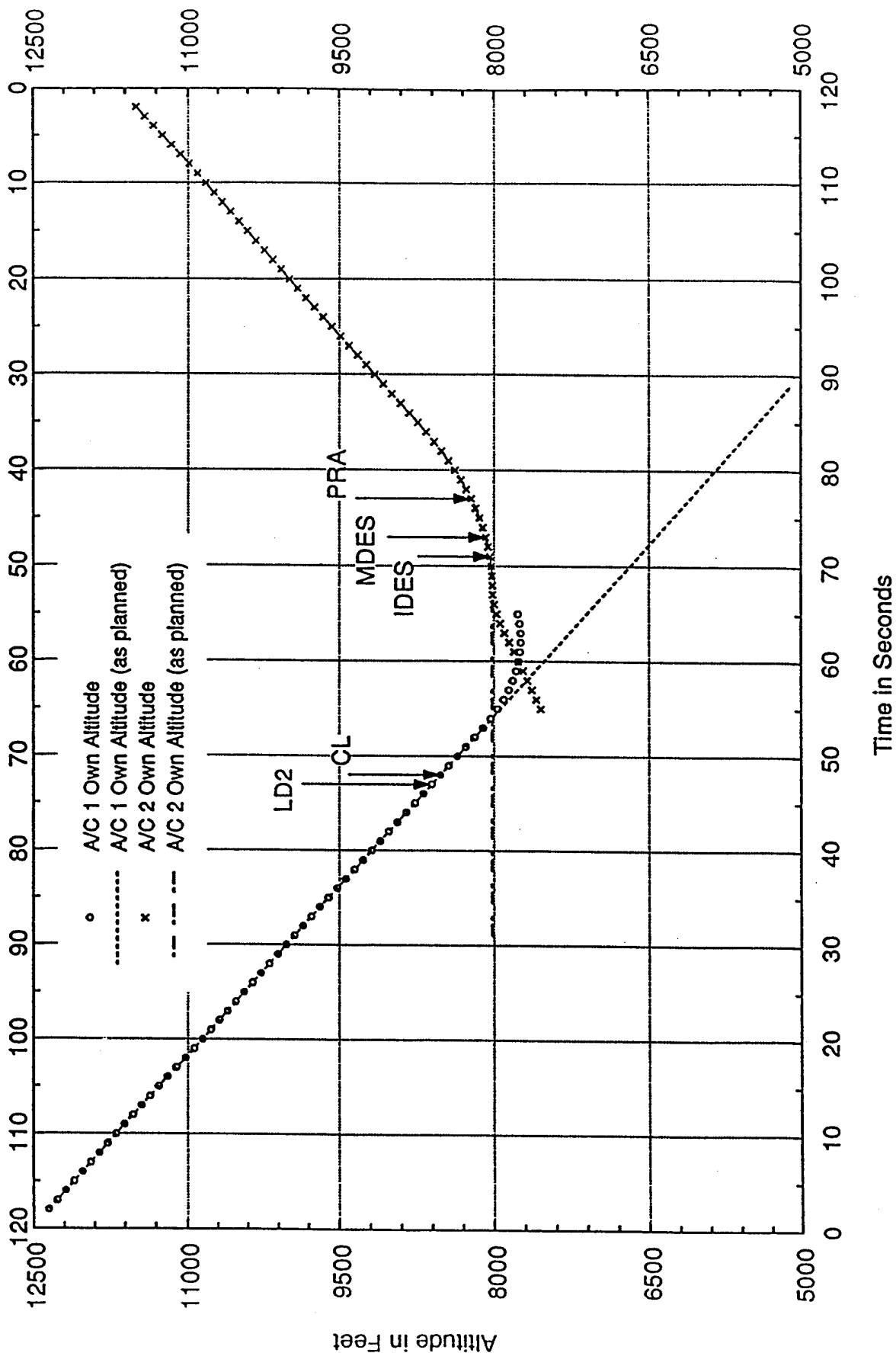
Performance Statistics (relate to whole class)

82% of RAs were non-crossing  
63% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL616WZL.605; REIT Number=4612

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



4612 6.02 RL VS 6.02 RH 6 515.43 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -500.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -25.0 7520.0  
 A/C1: CL616CE,2162022 |RELZ | LD2 @43 [NXRA] | CL @48  
 A/C2:CL616EG2,2262122 |RELZ | POTRA @42 (DFD) | MDES @43 [NXRA] | IDES @45

4612 6.04 RL VS 6.04 RH 6 -725.09 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -25.0 7520.0  
 A/C1: CL616OQ,2164033 |RELZ | DES @47 [XRA] | MDES @56  
 A/C2:CL616MO2,2264133 |TAUV | POTRA @43 (VTT) | CL @47 [XRA] | ICL @53

4612 6.04A RL VS 6.04A RH 6 18.15 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (-5000.0,-5000.0) (-5000.0,0.0) 0.00 0.15 0.0 -25.0 7520.0  
 A/C1: CL616XZ,2165044 |RELZ | LD2 @47 [NXRA] | CL @48  
 A/C2:CL616XZ2,2265144 |TAUV | POTRA @43 (VTT) | MDES @47 [NXRA] | IDES @49

Mitre encounter Class : 6

Reit number : 4612

NMAC Characterization

100% had pattern shown on attached plot  
planned separation = -250, -500 ft (evenly distributed)  
AC1 rates : -5000 fpm  
AC2 rates : -5000 fpm  
AC1 accel : 0.0 g  
AC2 accel : (17%) 0.15, (50%) 0.25, (33%) 0.35 g  
AC2 accel time : CPA: (83%) 20, (17%) 25 sec

Performance Statistics (relate to whole class)

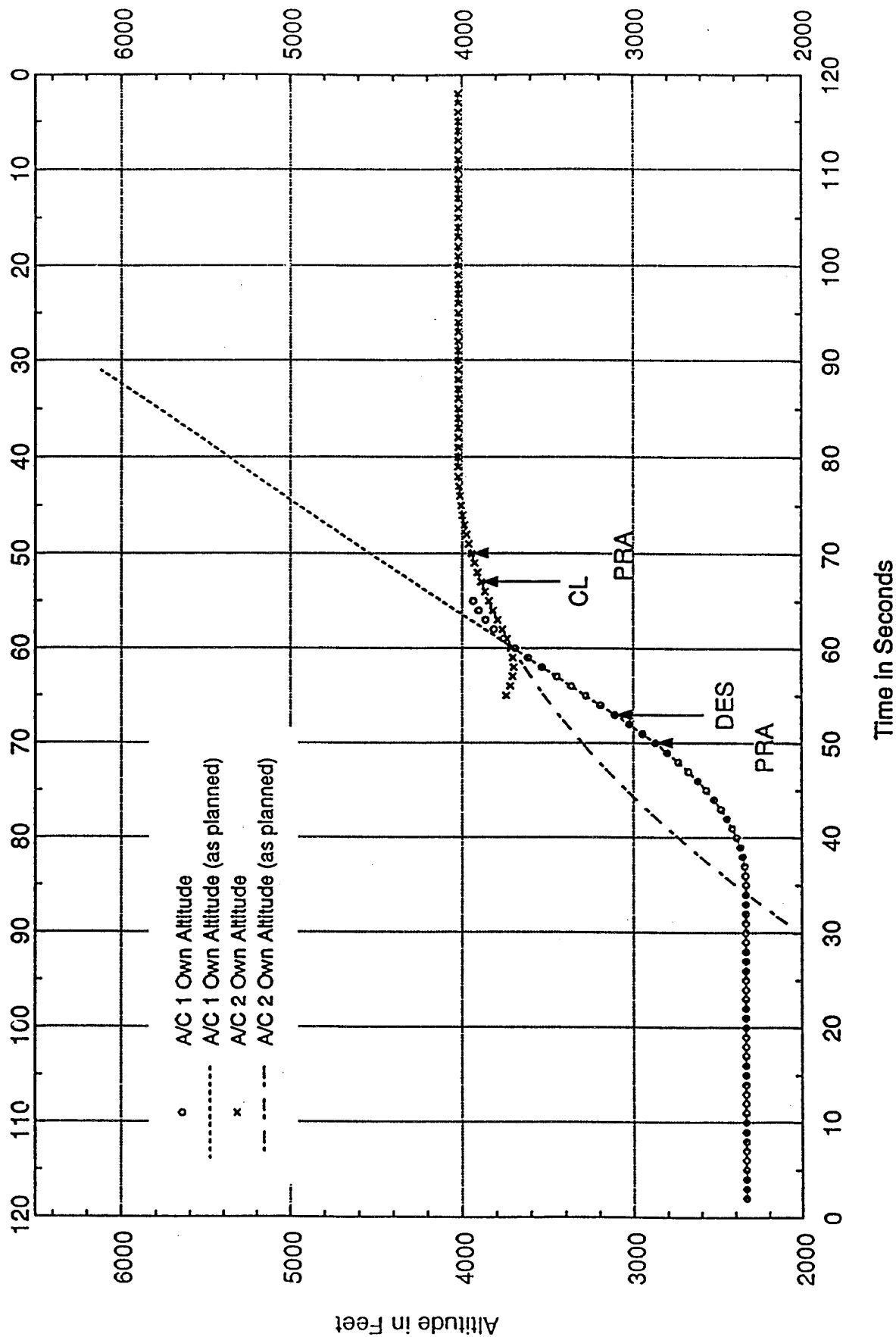
82% of RAs were non-crossing  
63% of NMACs were non-crossing



# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL717XZL.605; REIT Number=2538

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



2538	6.02	RL	VS	6.02	RH	7	-370.75	NON_CROSSING_ENCOUNTER
SL = 5	ZTHR = 750.0	TAUR = 25.0	TAUV = 25.0	ALIM = 400.0				
0.0	(0.0,5000.0)	(0.0,-5000.0)	0.15	-0.05	-25.0	-20.0	3700.0	
A/C1:	CL717CF,2162022	TAUV   LC2	@48	[NXRA]   DES	@55			
A/C2:	CL717EF2,2262122	TAUV   LD1	@49	[NXRA]   CL	@50			
2538	6.04	RL	VS	6:04	RH	7	-35.39	CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0				
0.0	(0.0,5000.0)	(0.0,-5000.0)	0.15	-0.05	-25.0	-20.0	3700.0	
A/C1:	CL717O,2164033	TAUV   POTRA	@50	(FRM)   DES	@53	[NXRA]		
A/C2:	CL717OP2,2264133	TAUV   POTRA	@50	(FRM)   CL	@53	[NXRA]		
2538	6.04A	RL	VS	6.04A	RH	7	-35.39	CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0				
0.0	(0.0,5000.0)	(0.0,-5000.0)	0.15	-0.05	-25.0	-20.0	3700.0	
A/C1:	CL717WZ,2165044	TAUV   POTRA	@50	(FRM)   DES	@53	[NXRA]		
A/C2:	CL717YZ2,2265144	TAUV   POTRA	@50	(FRM)   CL	@53	[NXRA]		

Mitre encounter Class : 7

Reit number : 2538

NMAC Characterization

100% had pattern shown on attached plot	
100% had planned separation =	0 ft
AC1 rates :	5000 fpm
AC2 rates :	-3000, -5000 fpm
AC1 accel :	0.15 g
AC2 accel :	-0.05 g
AC2 accel time : CPA:	20 sec

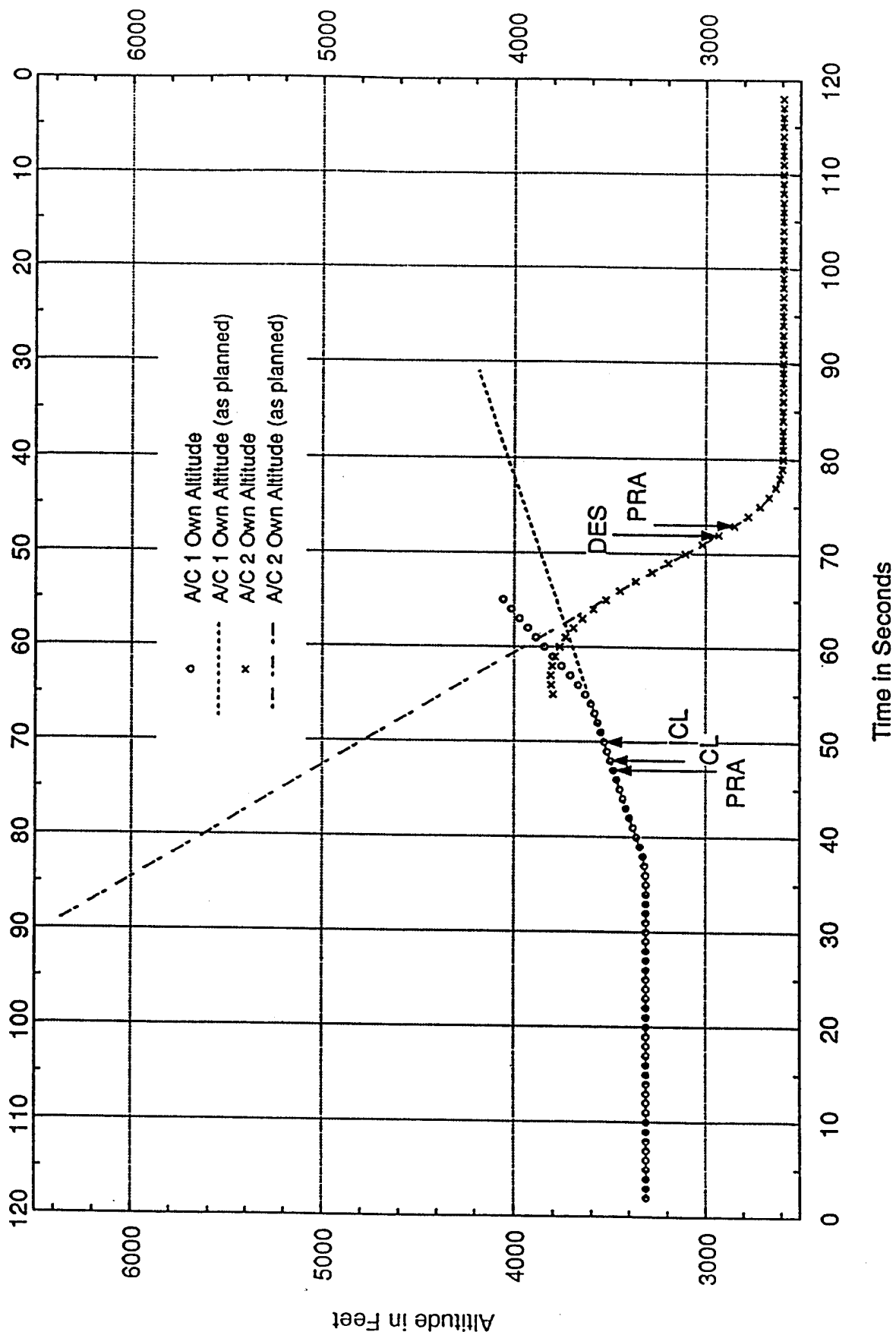
Performance Statistics (relate to whole class)

96%	of RAs were non-crossing
99%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL717XZL.605; REIT Number=2014

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



2014	6.02	RL VS 6.02 RH	7	658.58	NON_CROSSING_ENCOUNTER
SL = 5	ZTHR = 750.0	TAUR = 25.0	TAUV = 25.0	ALIM = 400.0	
-250.0	(0.0,1000.0)	(0.0,5000.0)	0.15	0.35 -25.0 -20.0	3700.0
A/C1:	CL717CF,2162022	TAUR   LD5	@34 [NXRA]	LD1 @44	LD2 @56
A/C2:	CL717EF2,2262122	TAUR   LC5	@34 [NXRA]	LC2 @45	

2014	6.04	RL VS 6.04 RH	7	-475.41	CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0	
-250.0	(0.0,1000.0)	(0.0,5000.0)	0.15	0.35 -25.0 -20.0	3700.0
A/C1:	CL717O,2164033	TAUV   DES	@47 [XRA]		
A/C2:	CL717OP2,2264133	TAUV   CL	@47 [XRA]	ICL @49	

2014	6.04A	RL VS 6.04A RH	7	94.30	NON_CROSSING_ENCOUNTER
SL = 4	ZTHR = 600.0	TAUR = 20.0	TAUV = 20.0	ALIM = 300.0	
-250.0	(0.0,1000.0)	(0.0,5000.0)	0.15	0.35 -25.0 -20.0	3700.0
A/C1:	CL717WZ,2165044	TAUV   POTRA @47	(6FT)   CL @48	[NXRA]	ICL @50
A/C2:	CL717YZ2,2265144	TAUV   POTRA @47	(DFD)   DES @48	[NXRA]	

Mitre encounter Class : 7      Reit number : 2014

NMAC Characterization

2% had pattern shown on attached plot			
planned separation =	+/-	250	ft
AC1 rates :	(60%)	5000 (40%)	1000 fpm
AC2 rates :	(60%)	1000 (40%)	5000 fpm
AC1 accel :	(80%)	0.15, (20%)	0.25 g
AC2 accel : (20%)	0.15, (20%)	0.25, (60%)	0.35 g
AC2 accel time :	no	distinct	pattern

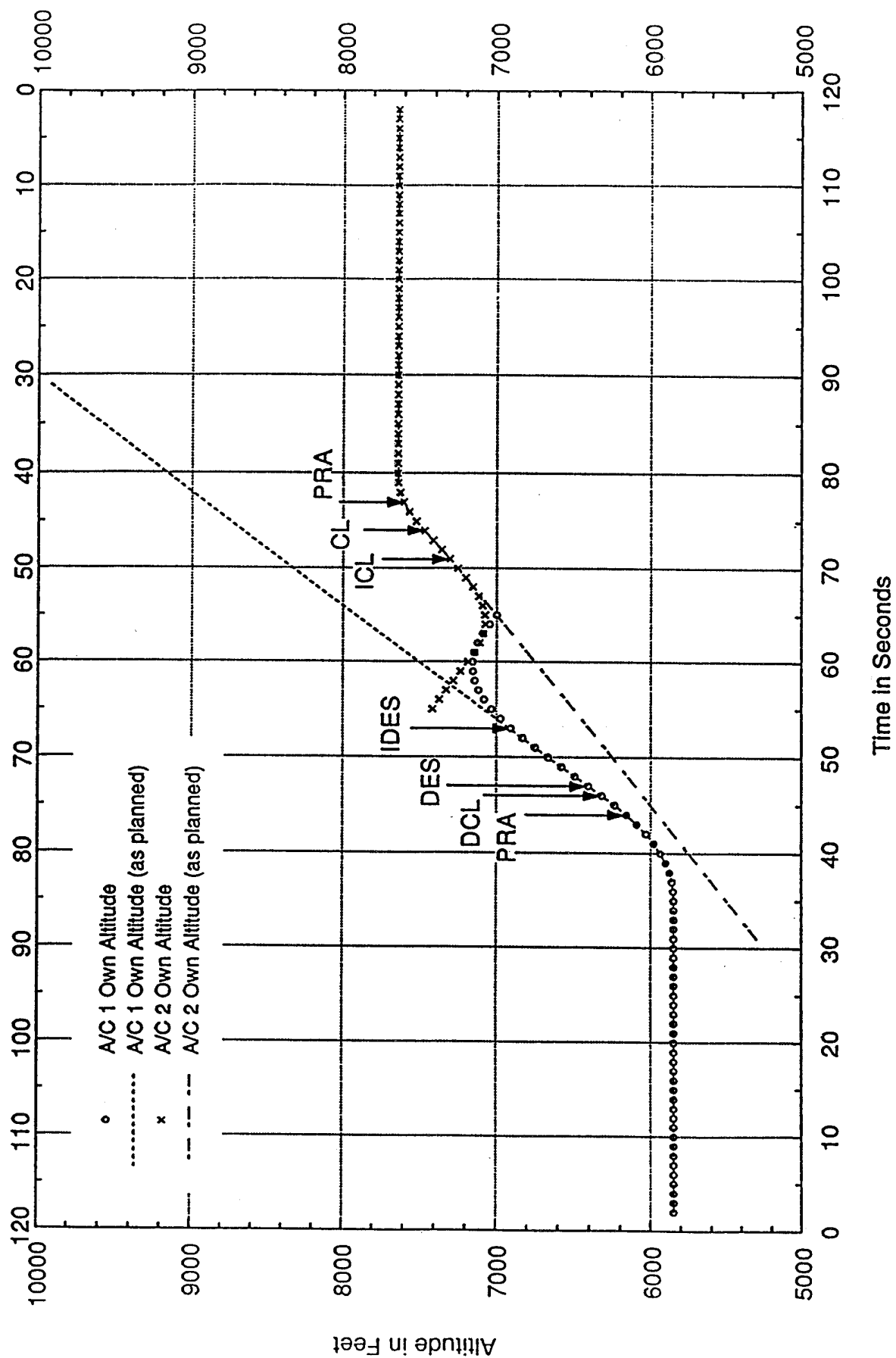
Performance Statistics (relate to whole class)

96% of RAs were non-crossing  
99% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL717XZL.605; REIT Number=8982

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



8982 6.02 RL VS 6.02 RH 7 -67.85 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0

750.0 (0.0,5000.0) (0.0,-3000.0) 0.25 -0.35 -25.0 -20.0 7500.0

A/C1: CL717CF,2162022 |TAUV | POTRA @44 (FRM) | DCL @46 [NXRA] | DES @47  
 | IDES @53

A/C2:CL717EF2,2262122 |TAUV | POTRA @43 (FRM) | CL @46 [NXRA] | ICL @49

8982 6.04 RL VS 6.04 RH 7 -67.85 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0

750.0 (0.0,5000.0) (0.0,-3000.0) 0.25 -0.35 -25.0 -20.0 7500.0

A/C1: CL717O,2164033 |TAUV | POTRA @44 (FRM) | DCL @46 [NXRA] | DES @47  
 | IDES @53

A/C2:CL717OP2,2264133 |TAUV | POTRA @43 (FRM) | CL @46 [NXRA] | ICL @49

8982 6.04A RL VS 6.04A RH 7 -67.85 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0

750.0 (0.0,5000.0) (0.0,-3000.0) 0.25 -0.35 -25.0 -20.0 7500.0

A/C1: CL717WZ,2165044 |TAUV | POTRA @44 (FRM) | DCL @46 [NXRA] | DES @47  
 | IDES @53

A/C2:CL717YZ2,2265144 |TAUV | POTRA @43 (FRM) | CL @46 [NXRA] | ICL @49



Mitre encounter Class : 7

Reit number : 8982

NMAC Characterization

97% had pattern shown on attached plot  
planned separation = 250, 500, or 750 ft  
AC1 rates : >= 1000 fpm  
AC2 rates : <= -1000 fpm  
AC1 accel : 0.15, 0.25, 0.35 g (evenly distributed)  
AC2 accel : -0.15, -0.25, -0.35 g (evenly distributed)  
AC2 accel time varies: (20, 25 or 30 sec before CPA)

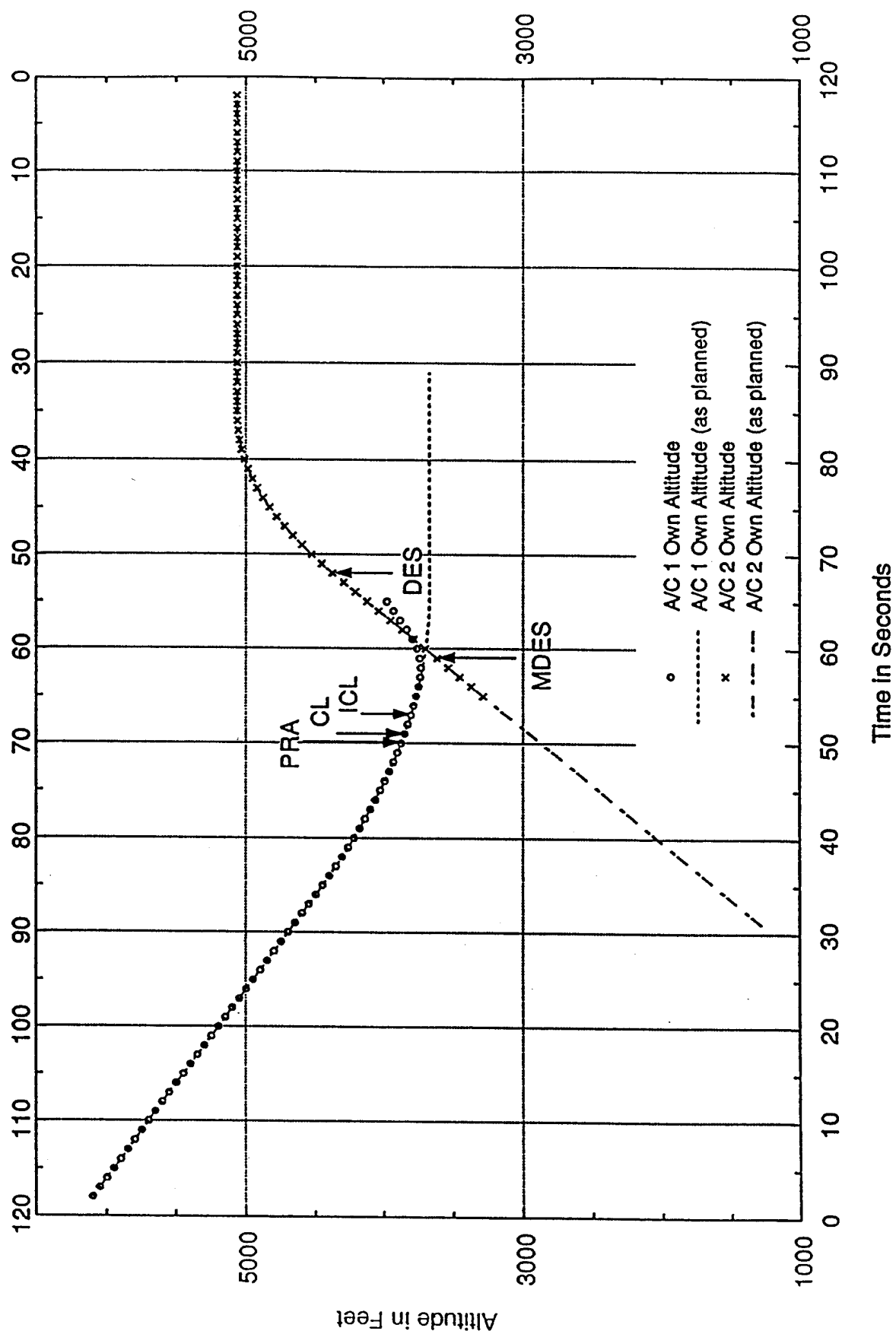
Performance Statistics (relate to whole class)

96% of RAs were non-crossing  
99% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL.605; REIT Number=0641

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



641 6.02 RL VS 6.02 RH 8 -285.17 CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0

0.0 (-3000.0,0.0) (0.0,-5000.0) 0.05 -0.15 -25.0 -25.0 3700.0

A/C1: CL818CF,2162022 |RELZ | MDES 049 [NXRA] | IDES 051

A/C2:CL818EH2,2262122 |RELZ | POTRA 048 (DFD) | CL 049 [NXRA]

641 6.04 RL VS 6.04 RH 8 77.21 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

0.0 (-3000.0,0.0) (0.0,-5000.0) 0.05 -0.15 -25.0 -25.0 3700.0

A/C1: CL818OR,2164033 |TAUV | POTRA 050 (FRM) | CL 051 [XRA] | ICL 053

A/C2:CL818OR2,2264133 |RELZ | DES 052 [XRA] | MDES 061

641 6.04A RL VS 6.04A RH 8 77.21 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

0.0 (-3000.0,0.0) (0.0,-5000.0) 0.05 -0.15 -25.0 -25.0 3700.0

A/C1: CL818WZ,2165044 |TAUV | POTRA 050 (FRM) | CL 051 [XRA] | ICL 053

A/C2:CL818XZ2,2265144 |RELZ | DES 052 [XRA] | MDES 061

Mitre encounter Class : 8      Reit number : 641

NMAC Characterization

13% had pattern shown on attached plot		
100% had planned separation =	0	ft
AC1 rates :	-3000	fpm
AC2 rates :	-5000	fpm
AC1 accel :	0.05	g
AC2 accel :	-0.15	g
AC2 accel time : CPA:	25	sec

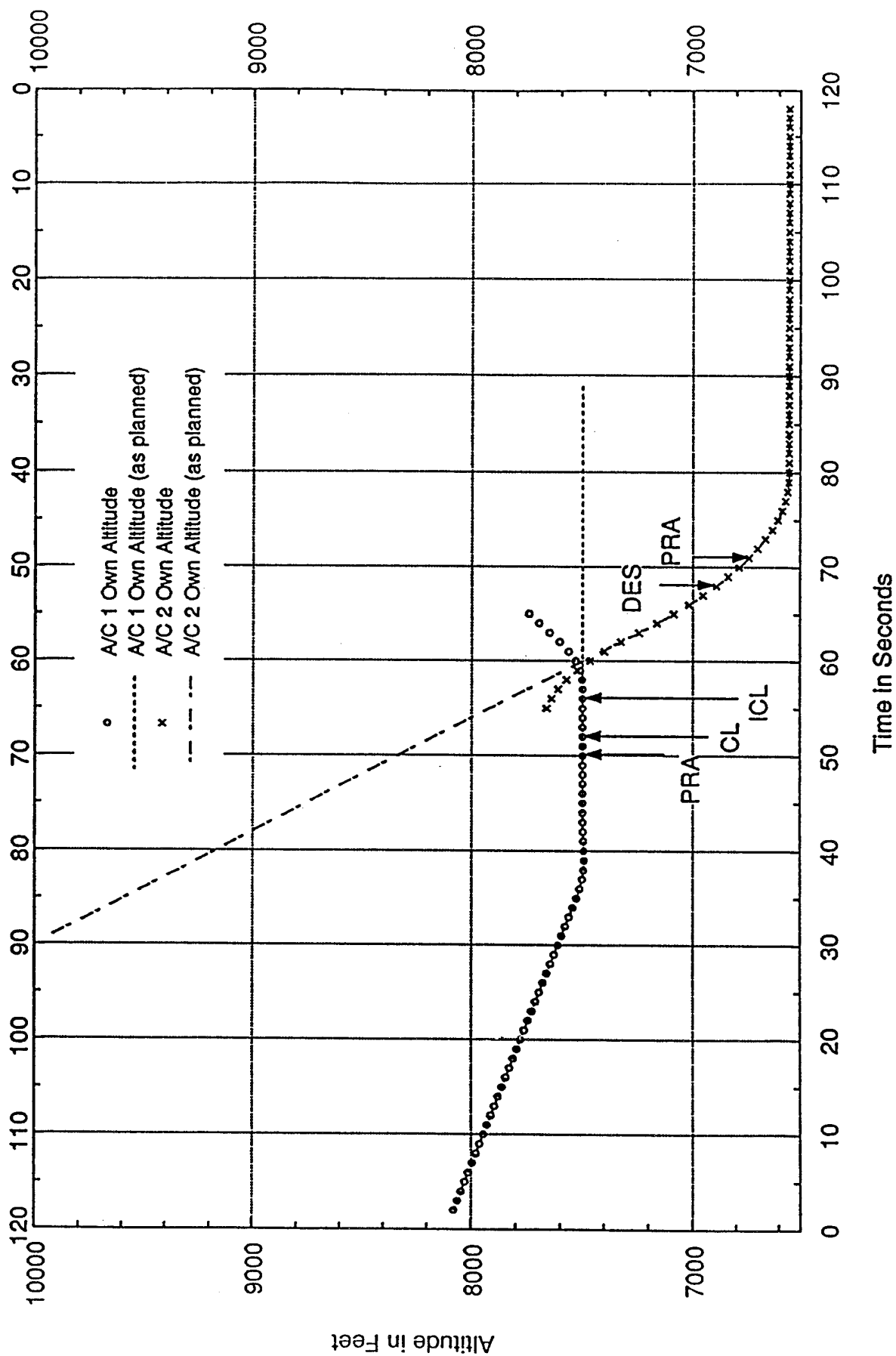
Performance Statistics (relate to whole class)

91%	of RAs were non-crossing
96%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL.605; REIT Number=7305

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



7305 6.02 RL VS 6.02 RH 8 248.72 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 0.0 (-1000.0,0.0) (0.0,5000.0) 0.15 0.15 -25.0 -20.0 7500.0  
 A/C1: CL818CF,2162022 |PVMD | CL @50 [NXRA] | ICL @56  
 A/C2:CL818EH2,2262122 |TAUV | POTRA @49 (DFD) | DES @50 [NXRA]

7305 6.04 RL VS 6.04 RH 8 82.53 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 0.0 (-1000.0,0.0) (0.0,5000.0) 0.15 0.15 -25.0 -20.0 7500.0  
 A/C1: CL818OR,2164033 |TAUV | POTRA @50 (VTT) | CL @52 [NXRA] | ICL @56  
 A/C2:CL818OR2,2264133 |TAUV | POTRA @49 (DFD) | DES @52 [NXRA]

7305 6.04A RL VS 6.04A RH 8 82.53 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 0.0 (-1000.0,0.0) (0.0,5000.0) 0.15 0.15 -25.0 -20.0 7500.0  
 A/C1: CL818WZ,2165044 |TAUV | POTRA @50 (VTT) | CL @52 [NXRA] | ICL @56  
 A/C2:CL818XZ2,2265144 |TAUV | POTRA @49 (DFD) | DES @52 [NXRA]

Mitre encounter Class : 8

Reit number : 7305

NMAC Characterization

23% had pattern shown on attached plot	
100% had planned separation =	0 ft
AC1 rates :	-1000, -3000 fpm
AC2 rates :	5000 fpm
AC1 accel :	0.5, 0.15, 0.25 g
AC2 accel :	0.15 g
AC2 accel time : CPA:	20 sec

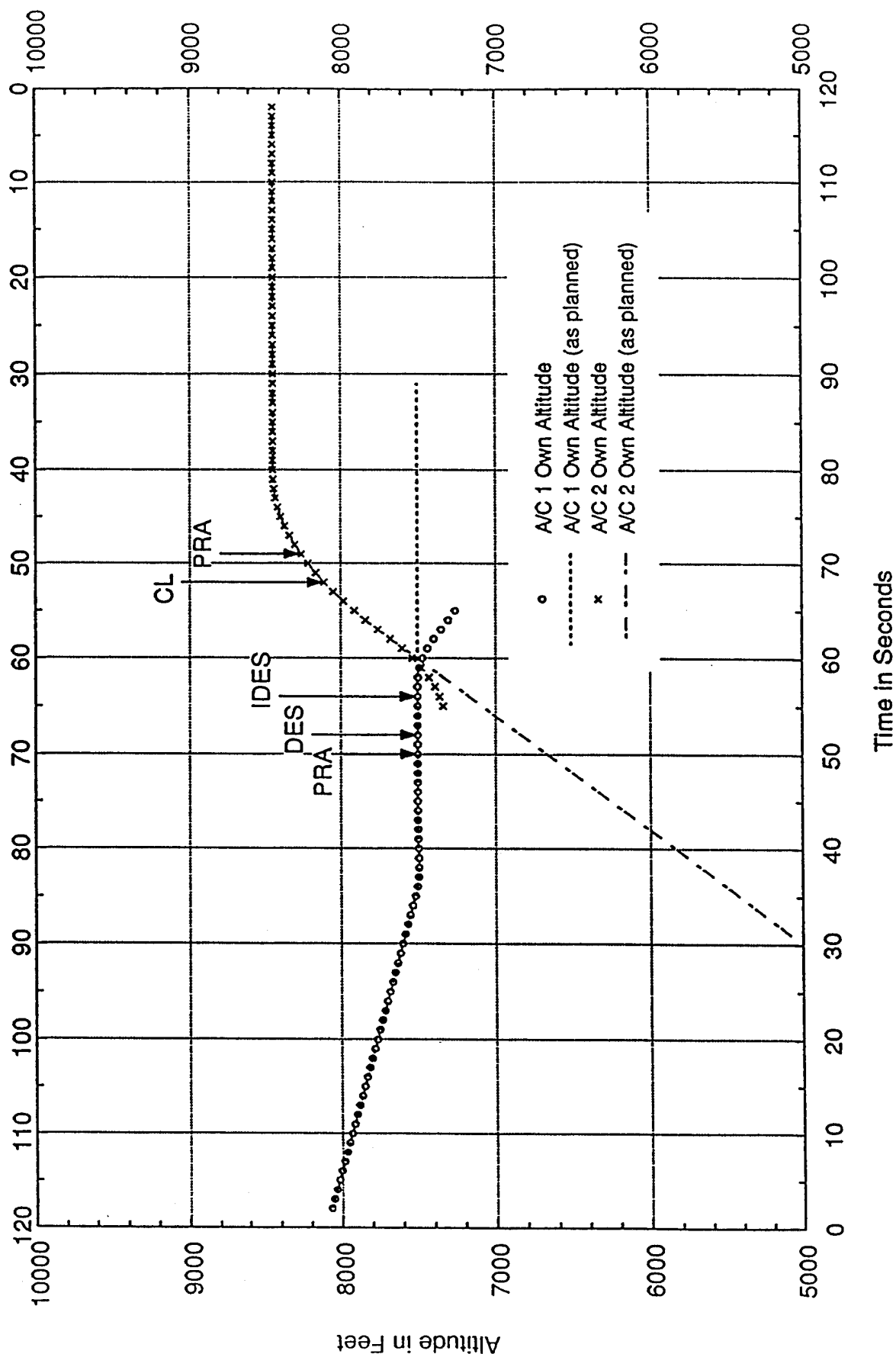
Performance Statistics (relate to whole class)

91%	of RAs were non-crossing
96%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL.605; REIT Number=8712

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)





8712 6.02 RL VS 6.02 RH 8 -248.72 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 0.0 (-1000.0,0.0) (0.0,-5000.0) 0.25 -0.15 -25.0 -20.0 7500.0

A/C1: CL818CF,2162022 | PVMD | DES 050 [NXRA] | IDES 056

A/C2: CL818EH2,2262122 | TAUU | POTRA 049 (DFD) | CL 050 [NXRA]

8712 6.04 RL VS 6.04 RH 8 -82.53 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 0.0 (-1000.0,0.0) (0.0,-5000.0) 0.25 -0.15 -25.0 -20.0 7500.0

A/C1: CL818OR,2164033 | TAUU | POTRA 050 (VTT) | DES 052 [NXRA] | IDES 056

A/C2: CL818OR2,2264133 | TAUU | POTRA 049 (DFD) | CL 052 [NXRA]

8712 6.04A RL VS 6.04A RH 8 -82.53 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 0.0 (-1000.0,0.0) (0.0,-5000.0) 0.25 -0.15 -25.0 -20.0 7500.0

A/C1: CL818WZ,2165044 | TAUU | POTRA 050 (VTT) | DES 052 [NXRA] | IDES 056

A/C2: CL818XZ2,2265144 | TAUU | POTRA 049 (DFD) | CL 052 [NXRA]

Mitre encounter Class : 8

Reit number : 8712

NMAC Characterization

64% had pattern shown on attached plot  
100% had planned separation = 0 ft  
AC1 rates : -1000, -3000, -5000 fpm  
AC2 rates : -5000 fpm  
AC1 accel : 0.05, 0.15, 0.25 g  
AC2 accel : -0.15, -0.25 g (most -0.15)  
AC2 accel time : CPA: 20 sec

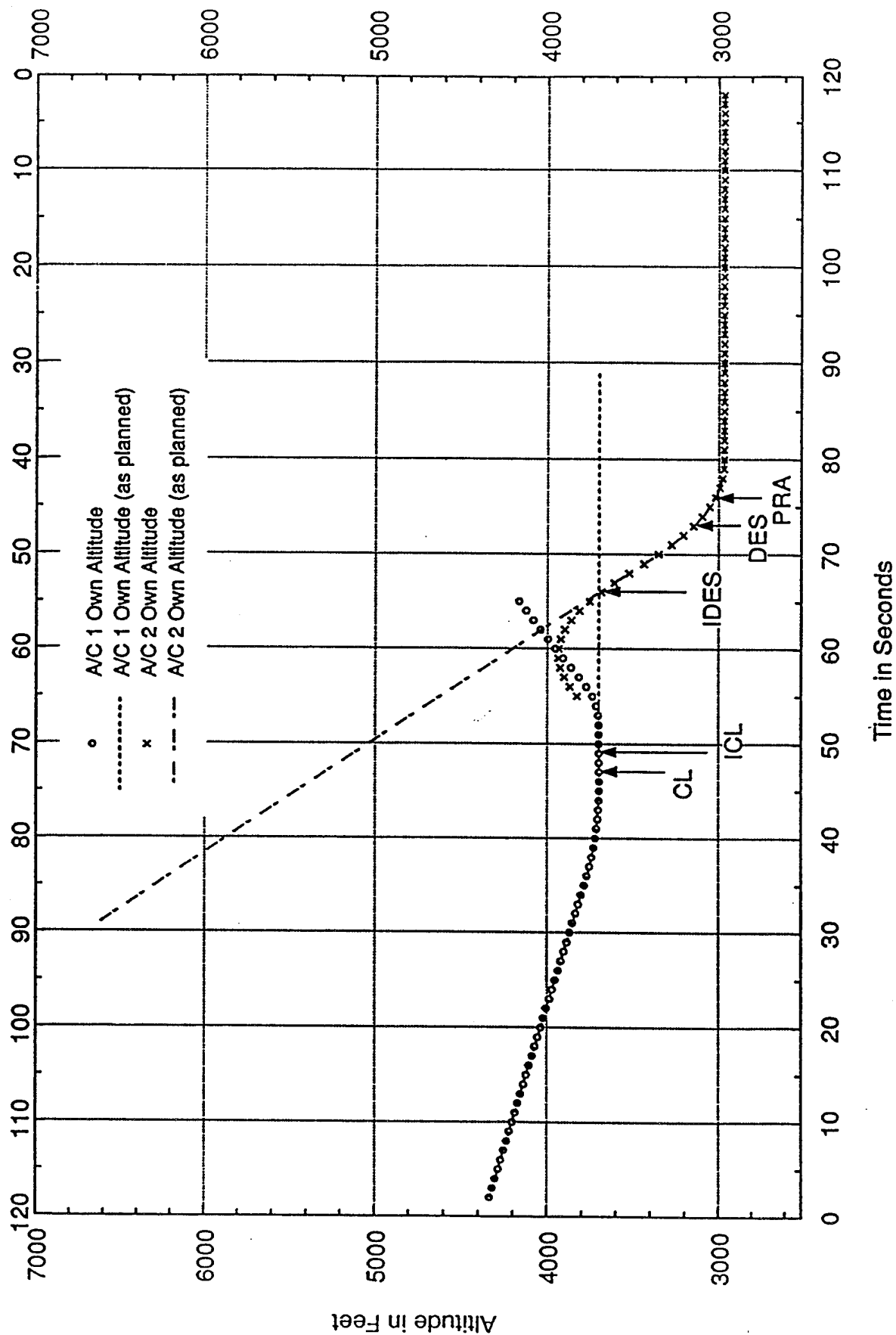
Performance Statistics (relate to whole class)

91% of RAs were non-crossing  
96% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL605; REIT Number=1385

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1385 6.02 RL VS 6.02 RH 8 817.42 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0

-500.0 (-1000.0,0.0) (0.0,5000.0) 0.05 0.25 -25.0 -20.0 3700.0

A/C1: CL818CF,2162022 |RELZ | LD5 @38 [NXRA]| DDES @45 | CL @48

A/C2: CL818EH2,2262122 |RELZ | DCL @40 [NXRA]| DES @41 | DCL @51

1385 6.04 RL VS 6.04 RH 8 39.36 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

-500.0 (-1000.0,0.0) (0.0,5000.0) 0.05 0.25 -25.0 -20.0 3700.0

A/C1: CL818OR,2164033 |RELZ | CL @47 [NXRA]| ICL @49

A/C2: CL818OR2,2264133 |TAUV | POTRA @44 (DFD) | DES @47 [NXRA]| IDES @54

1385 6.04A RL VS 6.04A RH 8 39.36 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

-500.0 (-1000.0,0.0) (0.0,5000.0) 0.05 0.25 -25.0 -20.0 3700.0

A/C1: CL818WZ,2165044 |RELZ | CL @47 [NXRA]| ICL @49

A/C2: CL818XZ2,2265144 |TAUV | POTRA @44 (DFD) | DES @47 [NXRA]| IDES @54

Mitre encounter Class : 8                      Reit number : 1385

NMAC Characterization

15% had pattern shown on attached plot  
planned separation =                      -250, -500                      ft  
AC1 rates :                      (80%) -1000, (20%) -3000                      fpm  
AC2 rates :                      5000                      fpm  
AC1 accel :                      0.05, 0.15, 0.25                      g (evenly distributed)  
AC2 accel :                      0.15, 0.25, 0.35                      g (evenly distributed)  
AC2 accel time : CPA: (93%) 20 or (7%) 25                      sec

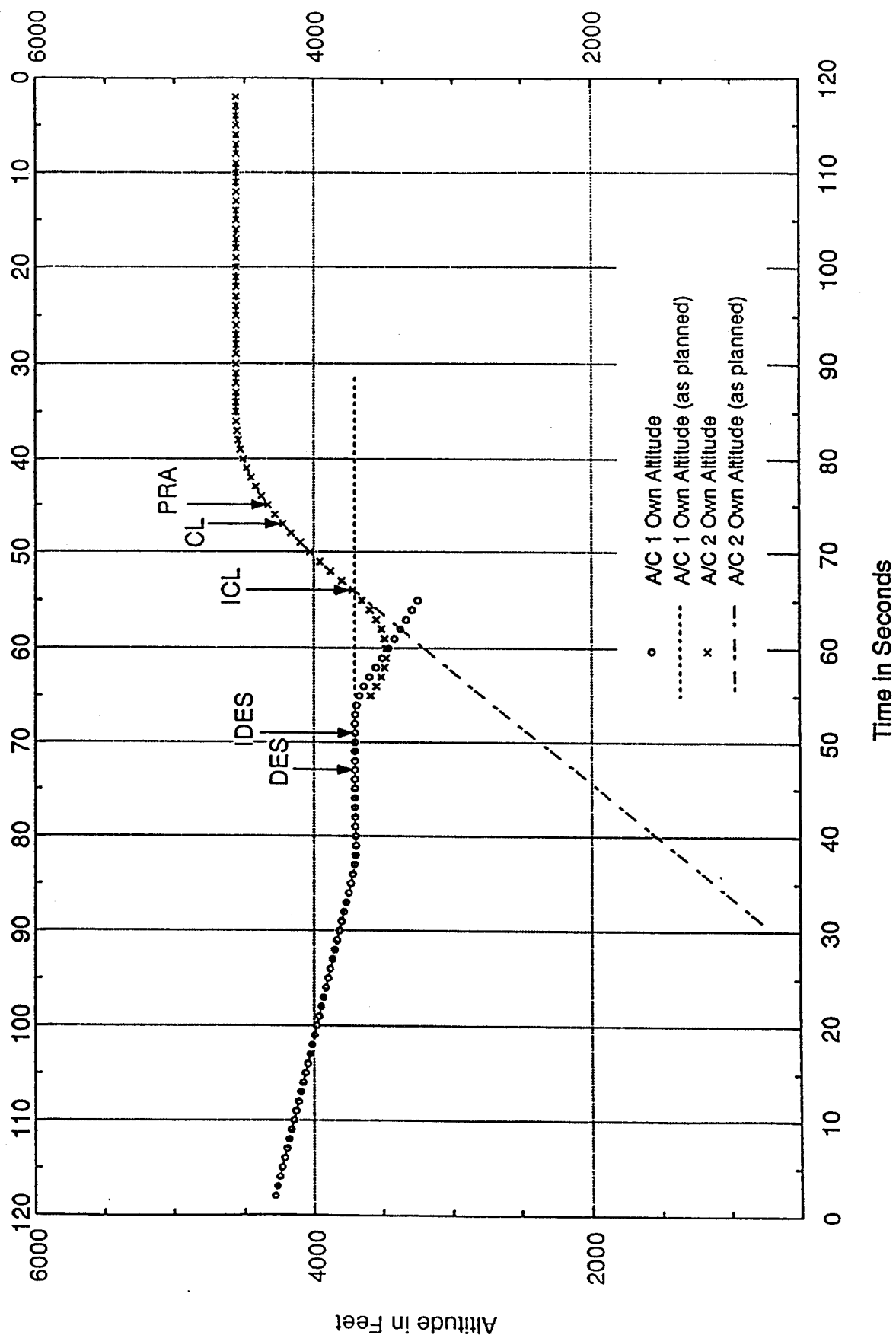
Performance Statistics (relate to whole class)

91% of RAs were non-crossing  
96% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL605; REIT Number=2655

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



2655 6.02 RL VS 6.02 RH 8 -508.13 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 500.0 (-1000.0,0.0) (0.0,-5000.0) 0.15 -0.15 -25.0 -25.0 3700.0

A/C1: CL818CF,2162022 |RELZ | DES @42 [NXRA] | IDES @52

A/C2:CL818EH2,2262122 |RELZ | DDES @44 [NXRA] | CL @45

2655 6.04 RL VS 6.04 RH 8 -38.78 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (-1000.0,0.0) (0.0,-5000.0) 0.15 -0.15 -25.0 -25.0 3700.0

A/C1: CL818OR,2164033 |RELZ | DES @47 [NXRA] | IDES @51

A/C2:CL818OR2,2264133 |TAUV | POTRA @45 (DFD) | CL @47 [NXRA] | ICL @54

2655 6.04A RL VS 6.04A RH 8 -38.78 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (-1000.0,0.0) (0.0,-5000.0) 0.15 -0.15 -25.0 -25.0 3700.0

A/C1: CL818WZ,2165044 |RELZ | DES @47 [NXRA] | IDES @51

A/C2:CL818XZ2,2265144 |TAUV | POTRA @45 (DFD) | CL @47 [NXRA] | ICL @54

Mitre encounter Class : 8

Reit number : 2655

NMAC Characterization

80% had pattern shown on attached plot  
planned separation = -500, -750 ft  
AC1 rates : <= -1000 fpm  
AC2 rates : <= -3000 fpm  
AC1 accel : 0.05, 0.15, 0.25 g  
AC2 accel : -0.15, -0.25, -0.35 g  
AC2 accel time : CPA:(67%) 20, (22%) 25, (11%) 30 sec

Performance Statistics (relate to whole class)

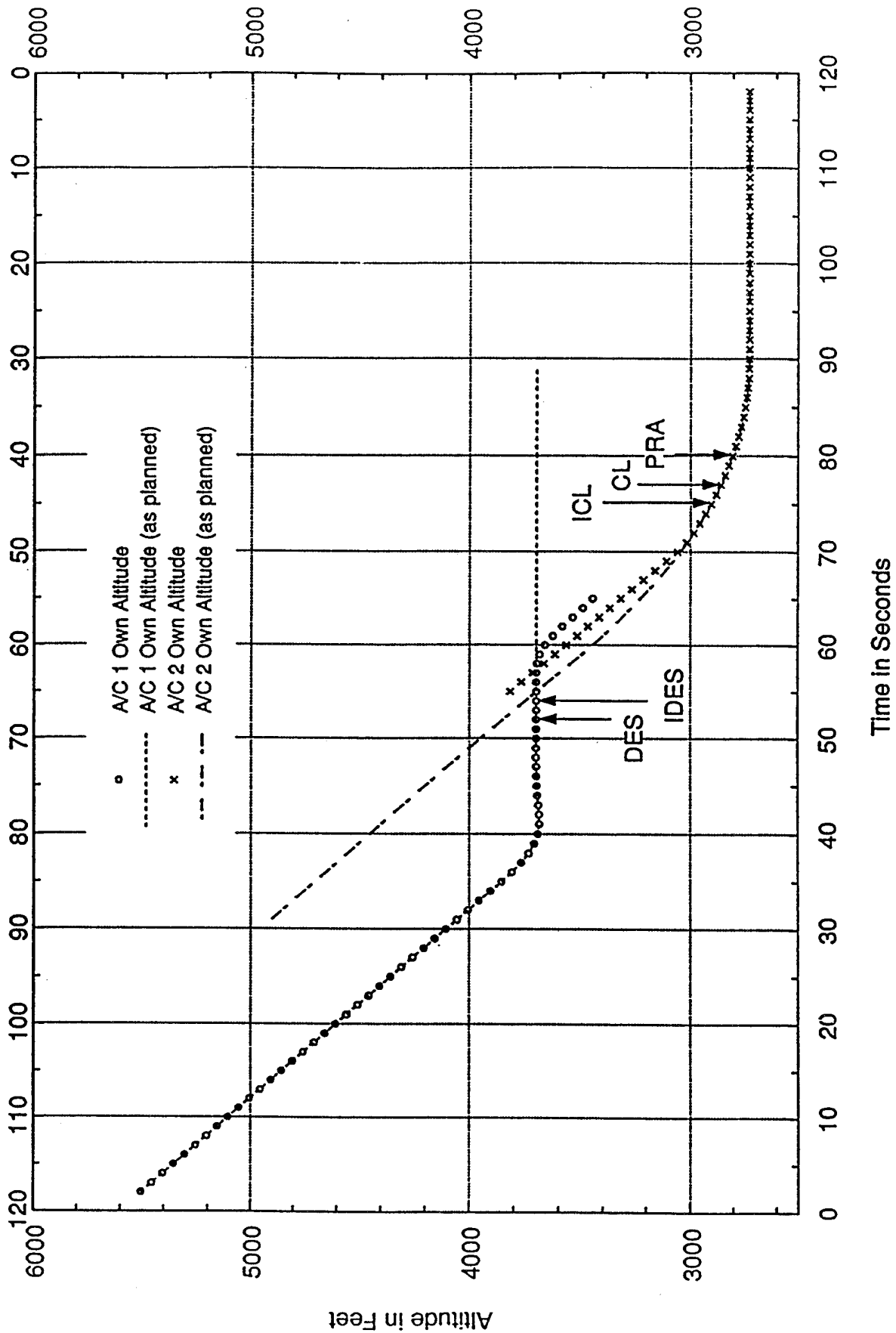
91% of RAs were non-crossing  
96% of NMACs were non-crossing



# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL605; REIT Number=3615

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



3615 6.02 RL VS 6.02 RH 8 822.04 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 250.0 (-3000.0,0.0) (0.0,3000.0) 0.25 0.05 -25.0 -30.0 3700.0  
 A/C1: CL818CF,2162022 |TAUR | LD1 Q34 [NXRA] | LD2 Q47  
 A/C2:CL818EH2,2262122 |TAUR | POTRA Q34 (LVW) | DES Q35 [NXRA] | LC1 Q45  
 | LC2 Q55

3615 6.04 RL VS 6.04 RH 8 82.28 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 250.0 (-3000.0,0.0) (0.0,3000.0) 0.25 0.05 -25.0 -30.0 3700.0  
 A/C1: CL818OR,2164033 |RELZ | DES Q52 [XRA] | IDES Q54  
 A/C2:CL818OR2,2264133 |TAUR | POTRA Q40 (DFD) | CL Q43 [XRA] | ICL Q45

3615 6.04A RL VS 6.04A RH 8 82.28 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 250.0 (-3000.0,0.0) (0.0,3000.0) 0.25 0.05 -25.0 -30.0 3700.0  
 A/C1: CL818WZ,2165044 |RELZ | DES Q52 [XRA] | IDES Q54  
 A/C2:CL818XZ2,2265144 |TAUR | POTRA Q40 (DFD) | CL Q43 [XRA] | ICL Q45

Mitre encounter Class : 8      Reit number : 3615

NMAC Characterization

2% had pattern shown on attached plot		
100% had planned separation =	250	ft
AC1 rates :	-3000	fpm
AC2 rates :	3000, 5000	fpm
AC1 accel :	0.15, 0.25	g
AC2 accel :	0.05	g
AC2 accel time : CPA:	30	sec

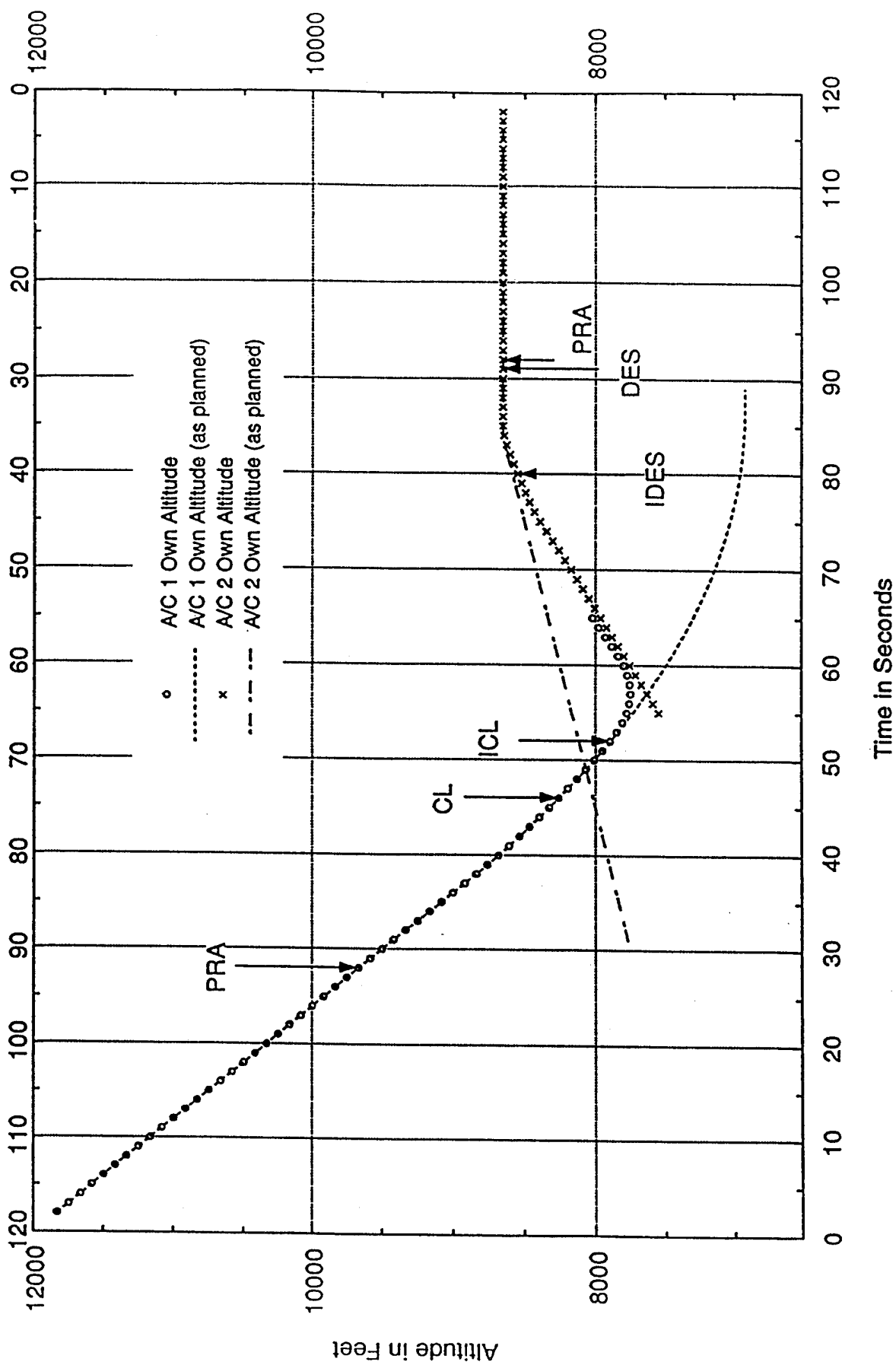
Performance Statistics (relate to whole class)

91%	of RAs were non-crossing
96%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZH.605; REIT Number=4970

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)



4970 6.02 RH VS 6.02 RL 8 -767.67 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -750.0 (-5000.0,0.0) (0.0,-1000.0) 0.05 -0.35 -25.0 -25.0 7500.0  
 A/C1: CL818CF,2162122 |PVMD | POTRA @50 (DFD) | MDES @53 [NXRA] | DES @61  
 A/C2:CL818EH2,2262022 |PVMD | LD2 @52 [NXRA]

4970 6.04 RH VS 6.04 RL 8 -749.99 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -750.0 (-5000.0,0.0) (0.0,-1000.0) 0.05 -0.35 -25.0 -25.0 7500.0  
 A/C1: CL818OR,2164133 NO RAS  
 A/C2:CL818OR2,2264033 NO RAS

4970 6.04A RH VS 6.04A RL 8 62.99 CROSSING\_ENCOUNTER  
 SL = 6 ZTHR = 600.0 TAUR = 30.0 TAUU = 30.0 ALIM = 400.0  
 -750.0 (-5000.0,0.0) (0.0,-1000.0) 0.05 -0.35 -25.0 -25.0 7500.0  
 A/C1: CL818WZ,2165144 |TAUR | POTRA @28 (DFD) | CL @46 [NXRA] | ICL @52  
 A/C2:CL818XZ2,2265044 |TAUR | POTRA @28 (LVW) | DES @29 [NXRA] | IDES @40

Mitre encounter Class : 8

Reit number : 4970

NMAC Characterization

3% had pattern shown on attached plot	
100% had planned separation =	-750 ft
AC1 rates :	-5000 fpm
AC2 rates :	-1000 fpm
AC1 accel :	0.05 g
AC2 accel :	-0.15, -0.25, -0.35 g
AC2 accel time : CPA:	(40%) 25, (60%) 30 sec

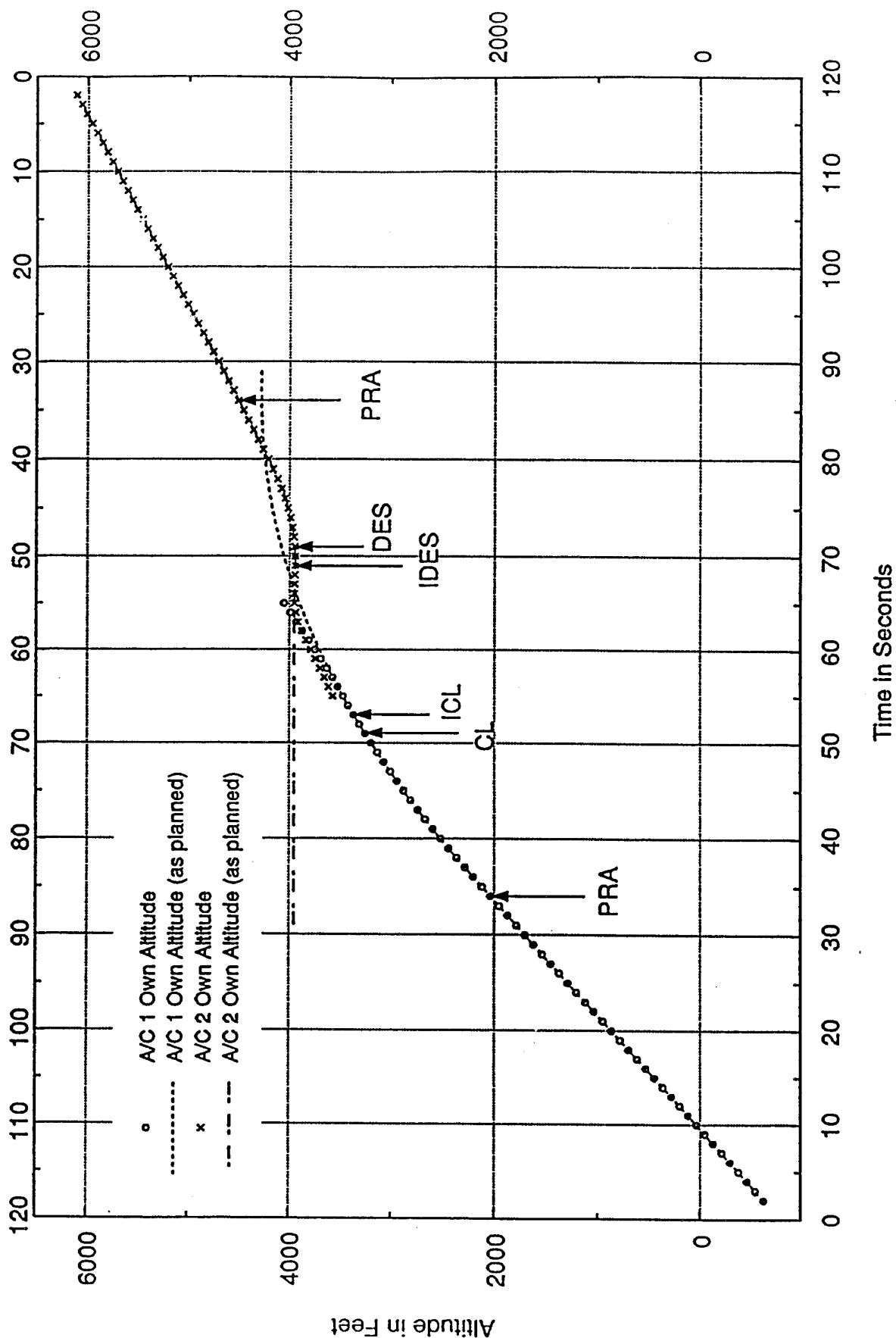
Performance Statistics (relate to whole class)

91%	of RAs were non-crossing
96%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL919YZH.605; REIT Number=1509

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)



1509 6.02 RH VS 6.02 RL 9 898.37 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUW = 25.0 ALIM = 400.0  
 -250.0 (5000.0,0.0) (-3000.0,0.0) -0.05 0.15 -25.0 -20.0 3700.0  
 A/C1: CL919CF,2162122 | PVMD | CL @38 [XRA] | LD2 @57  
 A/C2: CL919EH2,2262022 | PVMD | DES @35 [XRA] | IDES @54

1509 6.04 RH VS 6.04 RL 9 312.08 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 -250.0 (5000.0,0.0) (-3000.0,0.0) -0.05 0.15 -25.0 -20.0 3700.0  
 A/C1: CL919OR,2164133 | PVMD | CL @45 [XRA] | ICL @47 | CL @57  
 A/C2: CL919OR2,2264033 | PVMD | DES @44 [XRA] | IDES @50

1509 6.04A RH VS 6.04A RL 9 -27.82 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUW = 25.0 ALIM = 300.0  
 -250.0 (5000.0,0.0) (-3000.0,0.0) -0.05 0.15 -25.0 -20.0 3700.0  
 A/C1: CL919WZ,2165144 | TAUR | POTRA @34 (DFD) | CL @51 [XRA] | ICL @53  
 A/C2: CL919YZ2,2265044 | TAUR | POTRA @34 (6FT) | DES @49 [XRA] | IDES @51



Mitre encounter Class: 9      Reit number : 1509

NMAC Characterization

78% had pattern shown on attached plot  
100% had planned separation =      250 ft  
AC1 rates :      5000 fpm  
AC2 rates :      (7%) -3000, (93%) -5000 fpm  
AC1 accel :      -0.05, -0.15 g  
AC2 accel :      0.05, 0.15, 0.25, 0.35 g  
AC2 accel time : CPA: (50%) 20, (29%) 25, (21%) 30 sec

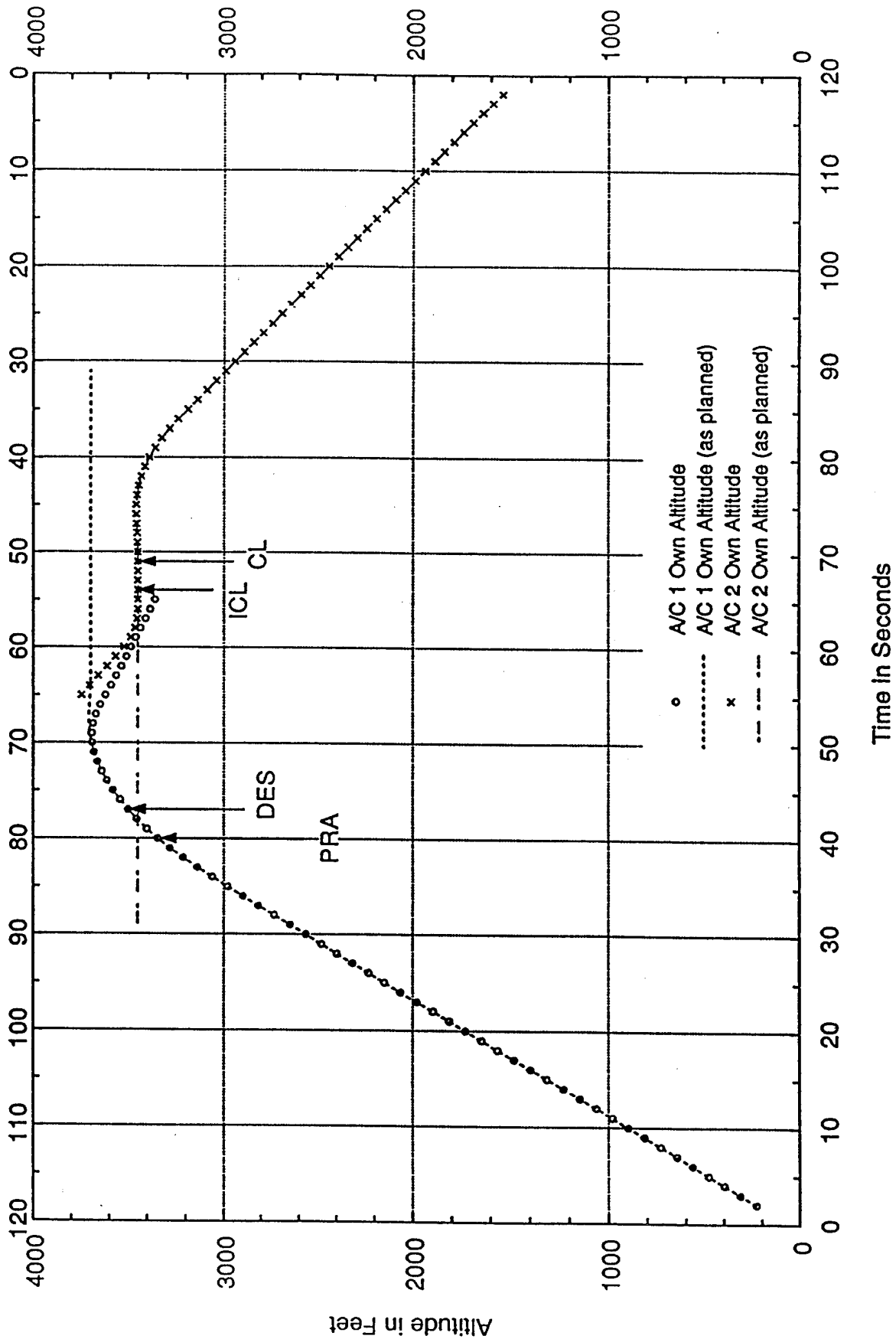
Performance Statistics (relate to whole class)

70% of RAs were non-crossing  
17% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL919YZH.605; REIT Number=3523

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)



3523 6.02 RH VS 6.02 RL 9 -779.19 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 250.0 (5000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -25.0 3700.0  
 A/C1: CL919CF,2162122 |TAUR | POTRA @34 (DFD) | DES @35 [NXRA] | LC1 @52  
 A/C2:CL919EH2,2262022 |TAUR | MCL @34 [NXRA] | CL @39 | ICL @40  
 | LD1 @54

3523 6.04 RH VS 6.04 RL 9 -54.29 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 250.0 (5000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -25.0 3700.0  
 A/C1: CL919OR,2164133 |TAUR | POTRA @40 (DFD) | DES @43 [NXRA]  
 A/C2:CL919OR2,2264033 |PVMD | CL @51 [XRA] | ICL @54

3523 6.04A RH VS 6.04A RL 9 -54.29 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 250.0 (5000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -25.0 3700.0  
 A/C1: CL919WZ,2165144 |TAUR | POTRA @40 (DFD) | DES @43 [NXRA]  
 A/C2:CL919YZ2,2265044 |PVMD | CL @51 [XRA] | ICL @54

Mitre encounter Class : 9      Reit number : 3523

NMAC Characterization

22% had pattern shown on attached plot  
planned separation = 250, +/- 500, 1000      ft  
AC1 rates :      1000, 5000      fpm  
AC2 rates :      3000, 5000      fpm  
AC1 accel :      -0.05, -0.15      g  
AC2 accel :      -0.05, -0.15, -0.25, -0.35      g  
AC2 accel time : CPA:      2 5      sec

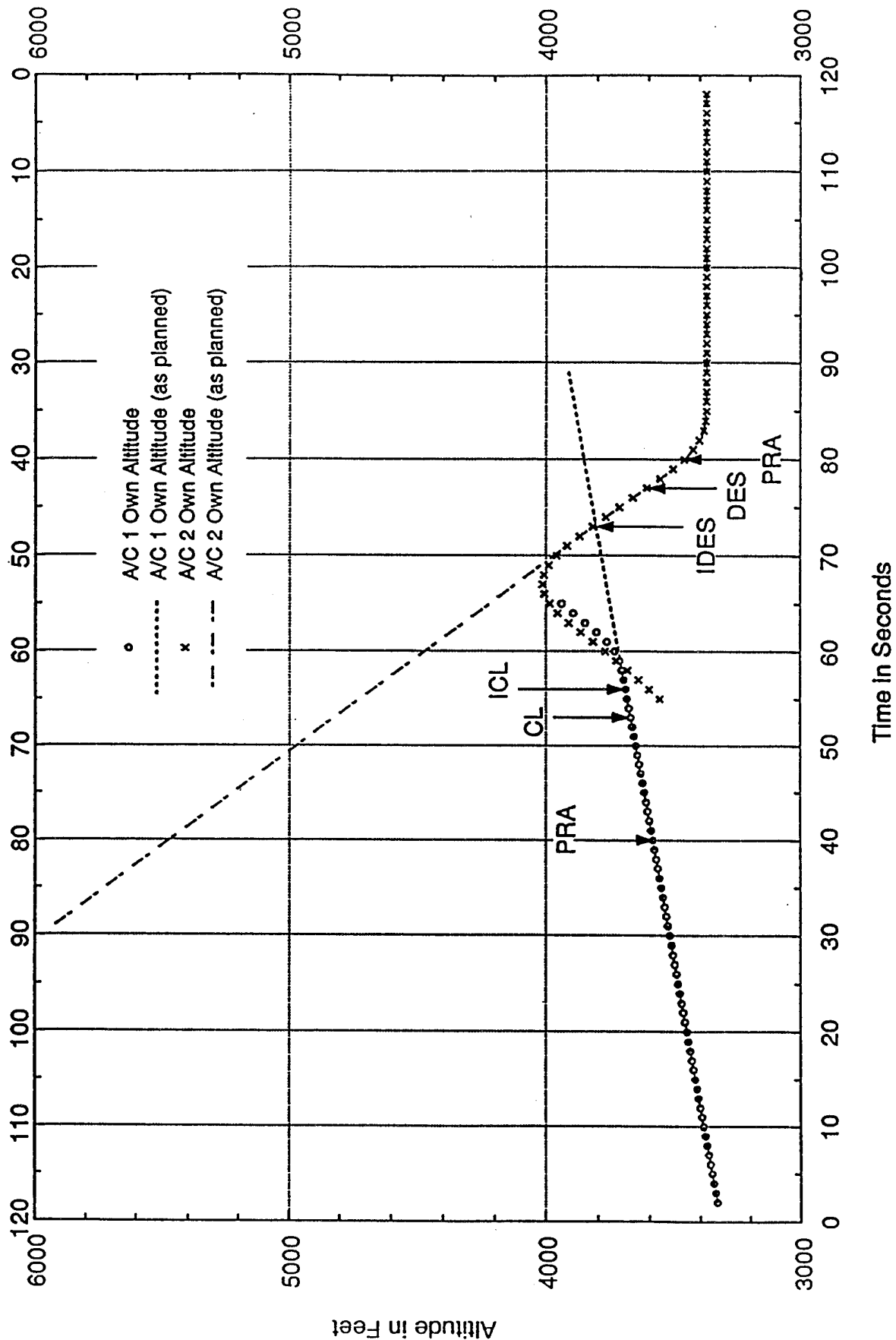
Performance Statistics (relate to whole class)

70% of RAs were non-crossing  
17% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL212OZL.605; REIT Number=1421

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1421 6.02 RL VS 6.02 RH 12 674.97 NON\_CROSSING\_ENCOUNTER

SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0

-750.0 ( 400.0, 400.0) (0.0,3000.0) 0.00 0.25 0.0 -25.0 3720.0

A/C1: CL212CH,2162022 |TAUR | CL 034 [NXRA] | LD1 051

A/C2:CL212EJ2,2262122 |TAUR | DES 034 [NXRA] | LC1 051

1421 6.04 RL VS 6.04 RH 12 -25.63 NON\_CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

-750.0 ( 400.0, 400.0) (0.0,3000.0) 0.00 0.25 0.0 -25.0 3720.0

A/C1: CL212OT,2164033 |TAUR | POTRA 040 (FRM) | CL 053 [XRA] | ICL 056

A/C2:CL212MR2,2264133 |TAUR | POTRA 040 (DFD) | DES 043 [NXRA] | IDES 047

1421 6.04A RL VS 6.04A RH 12 -25.63 NON\_CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0

-750.0 ( 400.0, 400.0) (0.0,3000.0) 0.00 0.25 0.0 -25.0 3720.0

A/C1: CL212UZ,2165044 |TAUR | POTRA 040 (FRM) | CL 053 [XRA] | ICL 056

A/C2:CL212UZ2,2265144 |TAUR | POTRA 040 (DFD) | DES 043 [NXRA] | IDES 047

Mitre encounter Class : 12      Reit number : 1421

NMAC Characterization

100% had pattern shown on attached plot	
100% had planned separation =	7 5 0      ft
AC1 rates :	4 0 0      fpm
AC2 rates :	3 0 0 0      fpm
AC1 accel :	0 . 0      g
AC2 accel :	0 . 2 5      g
AC2 accel time : CPA:	2 5      sec

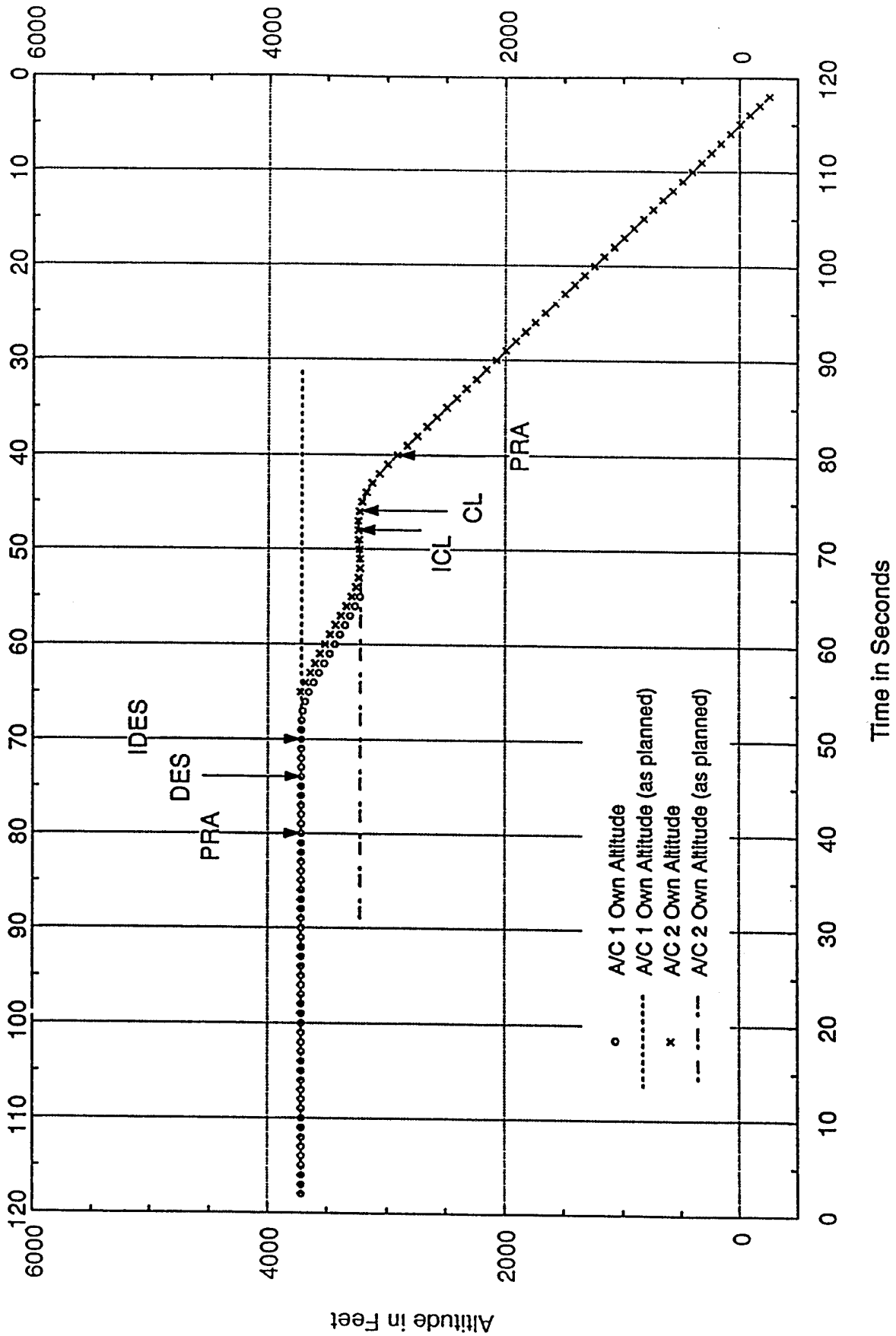
Performance Statistics (relate to whole class)

99%	of RAs were non-crossing
50%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL313SZL605; REIT Number=1614

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)





1614 6.02 RL VS 6.02 RH 13 -268.81 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 500.0 (0.0,0.0) (5000.0,0.0) 0.00 -0.35 0.0 -20.0 3720.0  
 A/C1: CL313CG,2162022 |TAUR | POTRA @34 (LVW) | LC1 @42 [XRA] | LC5 @44  
 | DES @46 | IDES @55  
 A/C2:CL313EH2,2262122 |PVMD | POTRA @40 (DFD) | CL @42 [XRA] | ICL @45

1614 6.04 RL VS 6.04 RH 13 -85.07 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (0.0,0.0) (5000.0,0.0) 0.00 -0.35 0.0 -20.0 3720.0  
 A/C1: CL313MQ,2164033 |PVMD | DES @46 [XRA] | IDES @50  
 A/C2:CL313OR2,2264133 |PVMD | POTRA @43 (DFD) | CL @46 [XRA] | ICL @48

1614 6.04A RL VS 6.04A RH 13 -85.07 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (0.0,0.0) (5000.0,0.0) 0.00 -0.35 0.0 -20.0 3720.0  
 A/C1: CL313WZ,2165044 |TAUR | POTRA @40 (LVW) | DES @46 [XRA] | IDES @50  
 A/C2:CL313YZ2,2265144 |TAUR | POTRA @40 (6FT) | CL @46 [XRA] | ICL @48

Mitre encounter Class : 13      Reit number : 1614

NMAC Characterization

100% had pattern shown on attached plot	
100% had planned separation =	500 ft
AC1 rates:	0 fpm
AC2 rates:	5000 fpm
AC1 accel:	0.0 g
AC2 accel:	-0.25, -0.35 g
AC2 accel time CPA:	20 sec

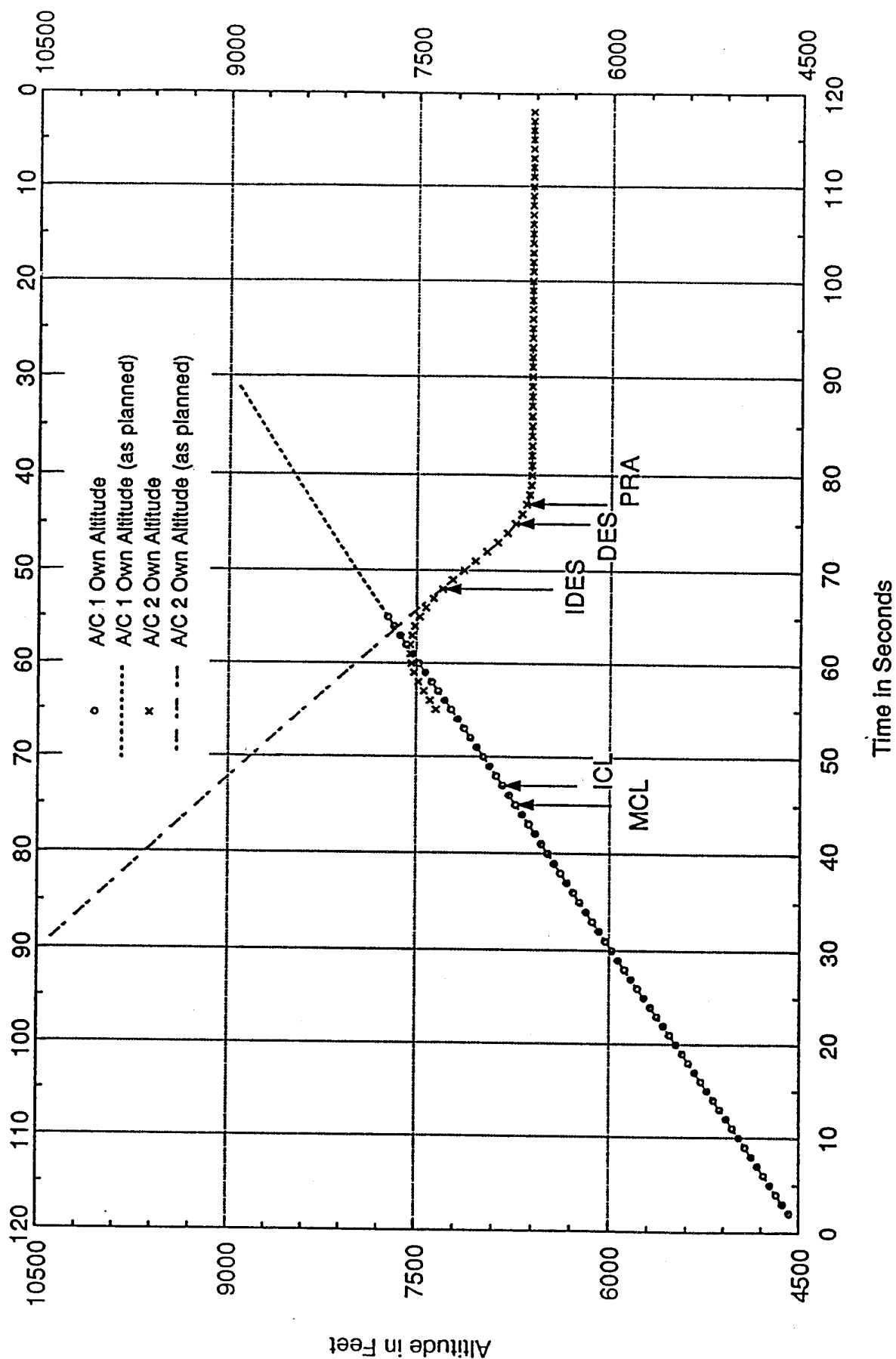
Performance Statistics (relate to whole class)

85%	of RAs were non-crossing
0%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL515WZL.605; REIT Number=4283

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



4283 6.02 RL VS 6.02 RH 15 137.02 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -500.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7480.0  
 A/C1: CL515CE,2162022 |PVMD | MCL @43 [NXRA]| ICL @45  
 A/C2:CL515EG2,2262122 |PVMD | POTRA @41 (DFD) | DES @43 [NXRA]| IDES @52

4283 6.04 RL VS 6.04 RH 15 -39.93 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7480.0  
 A/C1: CL515OQ,2164033 |PVMD | MCL @45 [NXRA]| ICL @47  
 A/C2:CL515MO2,2264133 |PVMD | POTRA @43 (DFD) | DES @45 [NXRA]| IDES @52

4283 6.04A RL VS 6.04A RH 15 -39.93 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (3000.0,3000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7480.0  
 A/C1: CL515XZ,2165044 |PVMD | MCL @45 [NXRA]| ICL @47  
 A/C2:CL515XZ2,2265144 |PVMD | POTRA @43 (DFD) | DES @45 [NXRA]| IDES @52

Mitre encounter Class : 15      Reit number : 4283

### NMAC Characterization

86% had pattern shown on attached plot					
planned separation =	(16%)	-250, (56%)	-500, (28%)	-750	ft
AC1 rates :		(39%)	5000, (61%)	3000	fpm
AC2 rates :			5000	5000	fpm
AC1 accel :				0.0	g
AC2 accel :		(6%)	0.15, (44%)	0.25, (50%)	0.35 g
AC2 accel time : CPA:			(78%)	20, or (22%)	25 sec

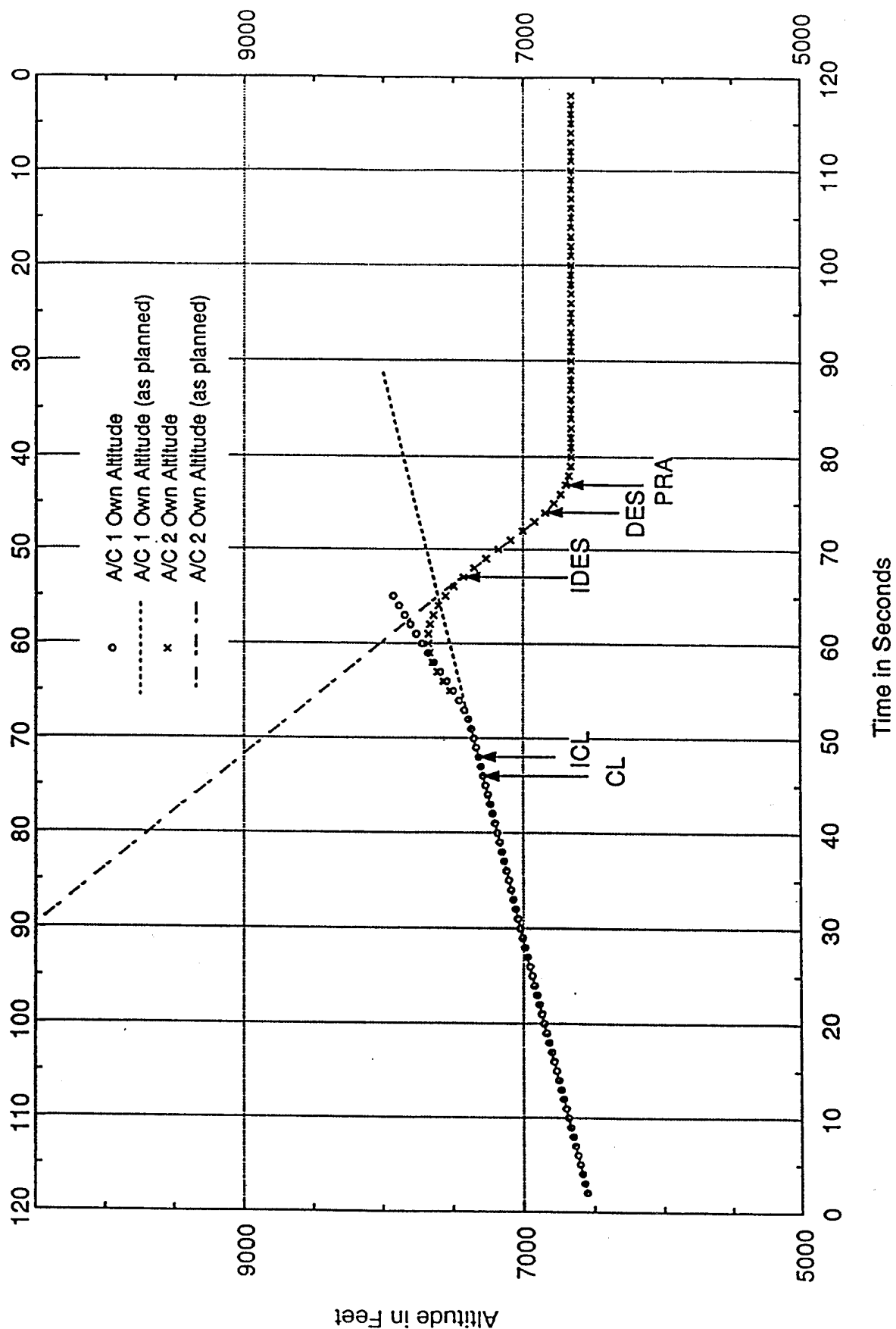
## Performance Statistics (relate to whole class)

91% of RAs were non-crossing  
40% of NMAs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL515WZL605; REIT Number=5543

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



5543 6.02 RL VS 6.02 RH 15 248.33 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -500.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7520.0  
 A/C1: CL515CE,2162022 |PVMD | CL 044 [NXRA] | ICL 046  
 A/C2:CL515EG2,2262122 |PVMD | POTRA 042 (DFD) | DES 044 [NXRA] | IDES 055

5543 6.04 RL VS 6.04 RH 15 63.21 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7520.0  
 A/C1: CL515OQ,2164033 |PVMD | CL 046 [NXRA] | ICL 048  
 A/C2:CL515MO2,2264133 |PVMD | POTRA 043 (DFD) | DES 046 [NXRA] | IDES 053

5543 6.04A RL VS 6.04A RH 15 63.21 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (1000.0,1000.0) (0.0,5000.0) 0.00 0.35 0.0 -20.0 7520.0  
 A/C1: CL515XZ,2165044 |PVMD | CL 046 [NXRA] | ICL 048  
 A/C2:CL515XZ2,2265144 |PVMD | POTRA 043 (DFD) | DES 046 [NXRA] | IDES 053

Mitre encounter Class : 15      Reit number : 5543

NMAC Characterization

14% had pattern shown on attached plot	
100% had planned separation =	-500 ft
AC1 rates :	1000 fpm
AC2 rates :	5000 fpm
AC1 accel :	0.0 g
AC2 accel :	0.25, 0.35 g
AC2 accel time : CPA:	20 sec

Performance Statistics (relate to whole class)

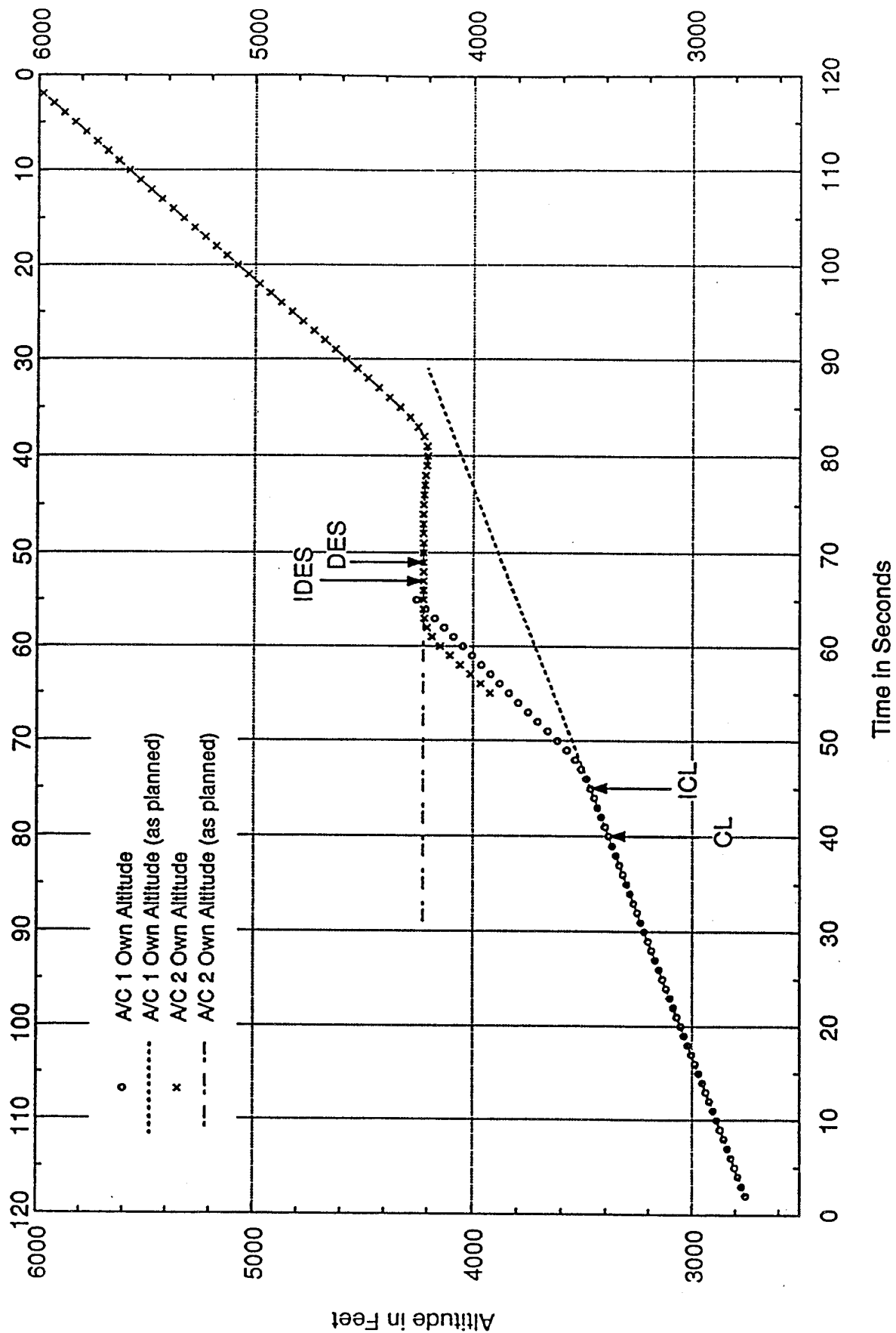
91%	of RAs were non-crossing
40%	of NMACs were non-crossing



# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL616WZL605; REIT Number=2491

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



2491 6.02 RL VS 6.02 RH 16 534.63 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUW = 25.0 ALIM = 400.0  
 -500.0 (1000.0,1000.0) (-3000.0,0.0) 0.00 0.35 0.0 -25.0 3720.0  
 A/C1: CL616CE,2162022 |TAUR | CL @34 [XRA] | ICL @53  
 A/C2:CL616EG2,2262122 |TAUR | DES @34 [XRA] | IDES @40

2491 6.04 RL VS 6.04 RH 16 -85.41 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 -500.0 (1000.0,1000.0) (-3000.0,0.0) 0.00 0.35 0.0 -25.0 3720.0  
 A/C1: CL616OO,2164033 |TAUR | CL @40 [XRA] | ICL @45  
 A/C2:CL616MO2,2264133 |RELZ | DES @51 [XRA] | IDES @53

2491 6.04A RL VS 6.04A RH 16 -85.41 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 -500.0 (1000.0,1000.0) (-3000.0,0.0) 0.00 0.35 0.0 -25.0 3720.0  
 A/C1: CL616XZ,2165044 |TAUR | CL @40 [XRA] | ICL @45  
 A/C2:CL616XZ2,2265144 |RELZ | DES @51 [XRA] | IDES @53

Mitre encounter Class : 16      Reit number : 2491

NMAC Characterization

100% had pattern shown on attached plot	
100% had planned separation =	-500 ft
AC1 rates :	1000 fpm
AC2 rates :	-3000 fpm
AC1 accel :	0.0 g
AC2 accel :	0.35 g
AC2 accel time : CPA :	25 sec

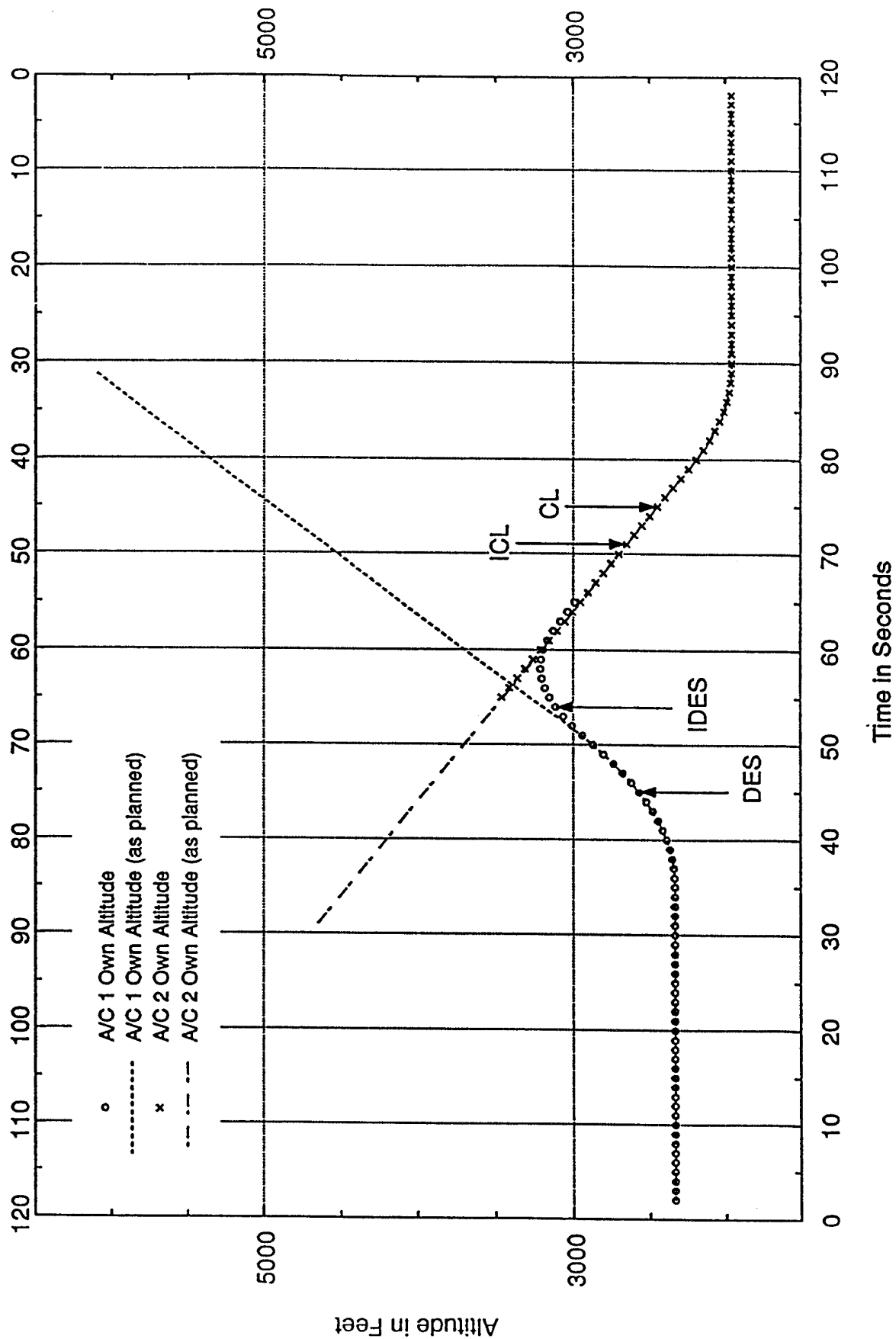
Performance Statistics (relate to whole class)

86%	of RAs were non-crossing
0%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL717XZL605; REIT Number=2732

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



2732 6.02 RL VS 6.02 RH 17 -663.91 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 750.0 TAUR = 20.0 TAUW = 20.0 ALIM = 400.0

500.0 (0.0,5000.0) (0.0,3000.0) 0.15 0.15 -25.0 -30.0 3700.0

A/C1: CL717CF,2162022 |TAUR | LC1 @40 [XRA] | DCL @42 | DES @43

A/C2:CL717EF2,2262122 |TAUR | POTRA @40 (FRM) | CL @41 [XRA] | ICL @46  
| MCL @56

2732 6.04 RL VS 6.04 RH 17 -33.01 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0

500.0 (0.0,5000.0) (0.0,3000.0) 0.15 0.15 -25.0 -30.0 3700.0

A/C1: CL717O,2164033 |TAUR | DES @45 [XRA] | IDES @54

A/C2:CL717OP2,2264133 |TAUR | CL @45 [XRA] | ICL @49

2732 6.04A RL VS 6.04A RH 17 -33.01 CROSSING\_ENCOUNTER

SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0

500.0 (0.0,5000.0) (0.0,3000.0) 0.15 0.15 -25.0 -30.0 3700.0

A/C1: CL717WZ,2165044 |TAUR | DES @45 [XRA] | IDES @54

A/C2:CL717YZ2,2265144 |TAUR | CL @45 [XRA] | ICL @49

Mitre encounter Class : 17      Reit number : 2732

NMAC Characterization

100% had pattern shown on attached plot  
planned separation =      250, 500      ft  
AC1 rates :      5000      fpm  
AC2 rates :      3000, 5000      fpm  
AC1 accel :      (93%) 0.15, (7%) 0.25      g  
AC2 accel :      0.15, 0.25, 0.35      g (evenly distributed)  
AC2 accel time : CPA:      25 or 30      sec (evenly distributed)

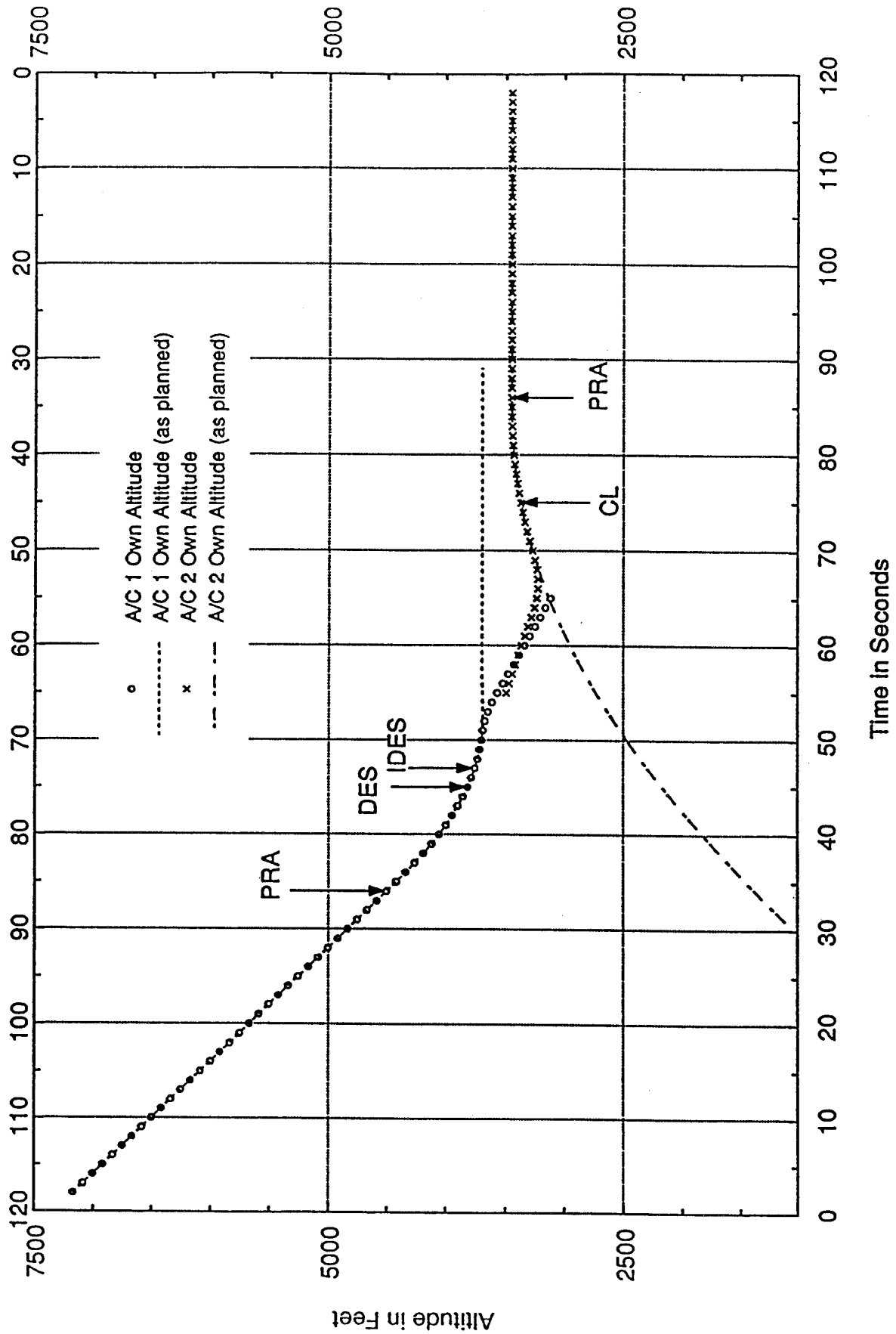
Performance Statistics (relate to whole class)

98% of RAs were non-crossing  
4% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZL.605; REIT Number=1520

SIM MODE:2165044 (Source: LL Composite FTEG Run, Dated 07/29/94)



1520 6.02 RL VS 6.02 RH 18 73.23 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUW = 25.0 ALIM = 400.0  
 750.0 (-5000.0,0.0) (0.0,-5000.0) 0.15 -0.05 -25.0 -25.0 3700.0  
 A/C1: CL818CF,2162022 |PVMD | POTRA @38 (FRM) | DES @46 [XRA] | IDES @48  
 A/C2:CL818EH2,2262122 |PVMD | POTRA @41 (LVW) | CL @46 [XRA]

1520 6.04 RL VS 6.04 RH 18 73.23 NON\_CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 750.0 (-5000.0,0.0) (0.0,-5000.0) 0.15 -0.05 -25.0 -25.0 3700.0  
 A/C1: CL818OR,2164033 |TAUR | POTRA @40 (FRM) | DES @46 [XRA] | IDES @48  
 A/C2:CL818OR2,2264133 |PVMD | POTRA @43 (LVW) | CL @46 [XRA]

1520 6.04A RL VS 6.04A RH 18 -30.53 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUW = 25.0 ALIM = 350.0  
 750.0 (-5000.0,0.0) (0.0,-5000.0) 0.15 -0.05 -25.0 -25.0 3700.0  
 A/C1: CL818WZ,2165044 |TAUR | POTRA @34 (6FT) | DES @45 [XRA] | IDES @47  
 A/C2:CL818XZ2,2265144 |TAUR | POTRA @34 (LVW) | CL @45 [XRA]



Mitre encounter Class : 18      Reit number : 1520

NMAC Characterization

71% had pattern shown on attached plot  
planned separation = 250, 500, 750 ft  
AC1 rates : -5000 fpm  
AC2 rates : (41%) -3000, (59%) -5000 fpm  
AC1 accel : 0.05, 0.15 g  
AC2 accel : -0.05, -0.15, -0.25 g  
AC2 accel time : CPA: (83%) 20, (17%) 25 sec

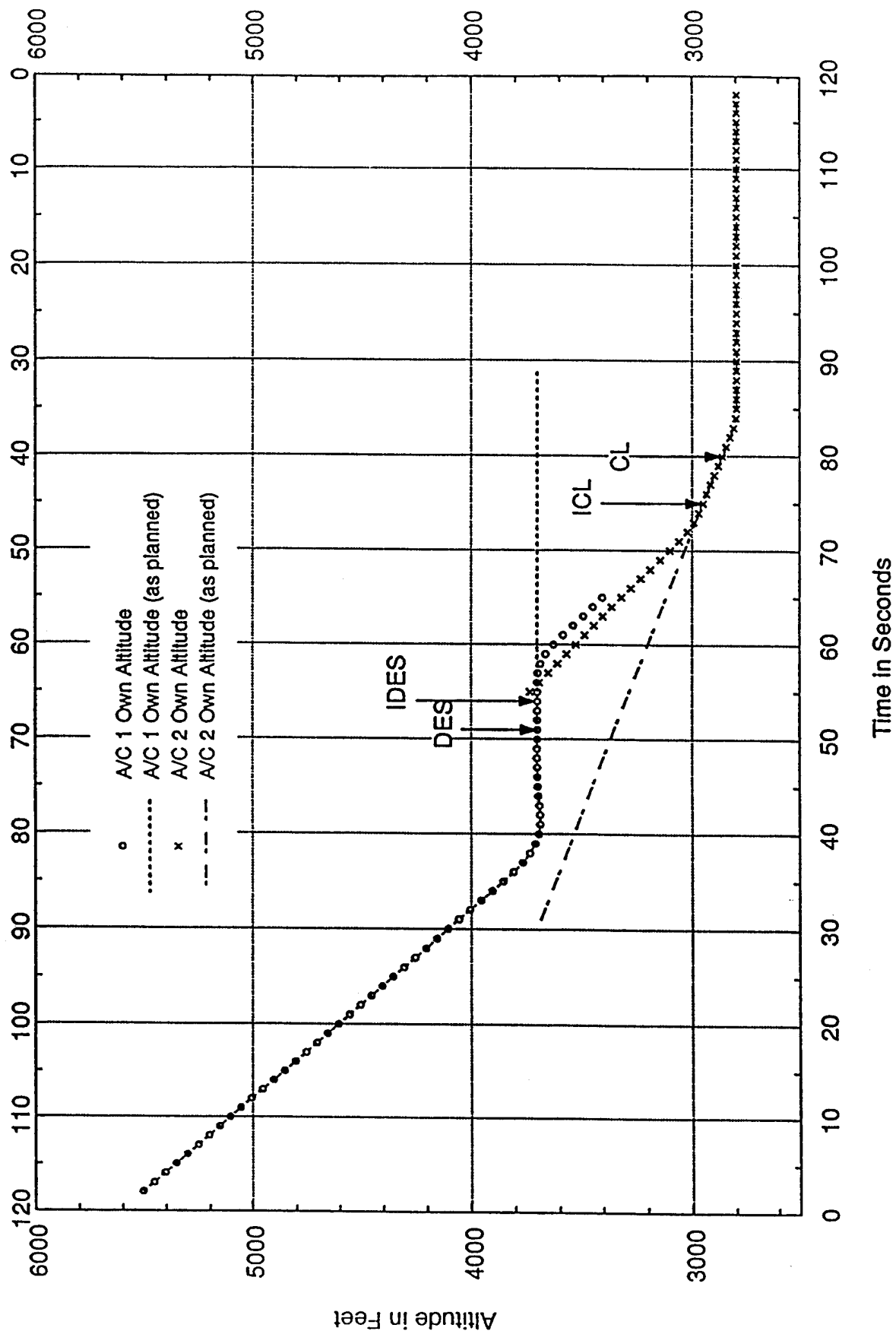
Performance Statistics (relate to whole class)

89% of RAs were non-crossing  
33% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL818YZH.605; REIT Number=3978

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)



3978 6.02 RH VS 6.02 RL 18 961.25 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUW = 25.0 ALIM = 400.0  
 500.0 (-3000.0,0.0) (0.0,1000.0) 0.25 0.35 -25.0 -25.0 3700.0  
 A/C1: CL818CF,2162122 |TAUR | POTRA @34 (DFD) | CL @36 [NXRA] | LD1 @46  
 | LD2 @56  
 A/C2:CL818EH2,2262022 |TAUR | POTRA @34 (LVW) | DES @35 [NXRA] | LC1 @45  
 | LC2 @58

3978 6.04 RH VS 6.04 RL 18 85.41 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 500.0 (-3000.0,0.0) (0.0,1000.0) 0.25 0.35 -25.0 -25.0 3700.0  
 A/C1: CL818OR,2164133 |RELZ | DES @51 [XRA] | IDES @54  
 A/C2:CL818OR2,2264033 |TAUR | CL @40 [XRA] | ICL @45

3978 6.04A RH VS 6.04A RL 18 85.41 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUW = 20.0 ALIM = 300.0  
 500.0 (-3000.0,0.0) (0.0,1000.0) 0.25 0.35 -25.0 -25.0 3700.0  
 A/C1: CL818WZ,2165144 |RELZ | DES @51 [XRA] | IDES @54  
 A/C2:CL818XZ2,2265044 |TAUR | CL @40 [XRA] | ICL @45

Mitre encounter Class : 18      Reit number : 3978

NMAC Characterization

29% had pattern shown on attached plot		
100% had planned separation =	500	ft
AC1 rates :	-3000	fpm
AC2 rates :	1000	fpm
AC1 accel :	0.25	g
AC2 accel :	0.05, 0.15, 0.25, 0.35	g
AC2 accel time : CPA: (60%) 25, (40%) 30		sec

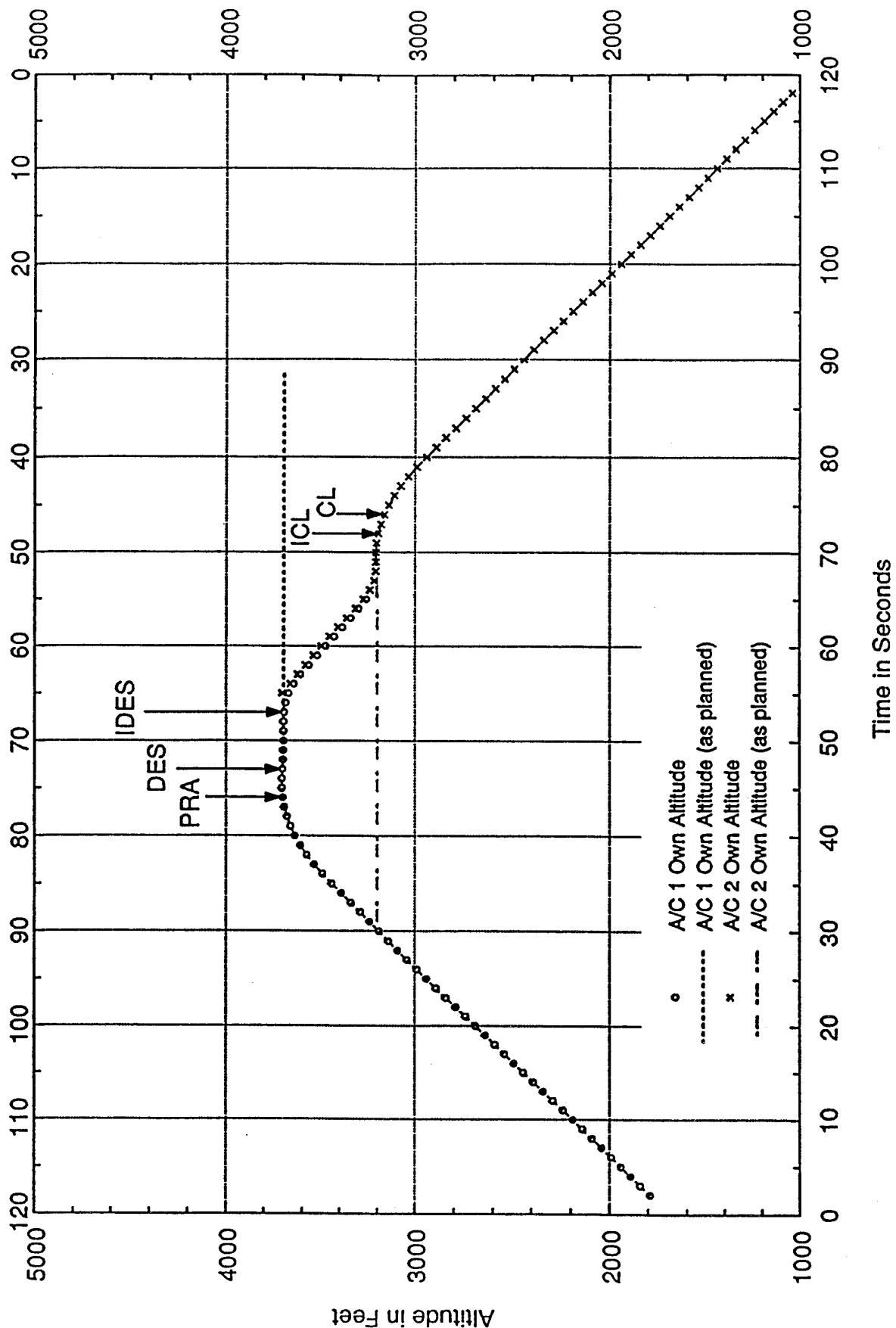
Performance Statistics (relate to whole class)

89%	of RAs were non-crossing
33%	of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL919YZH.605; REIT Number=2883

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)



2883 6.02 RH VS 6.02 RL 19 1004.89 NON\_CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 500.0 (3000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -20.0 3700.0  
 A/C1: CL919CF,2162122 |RELZ | MCL @38 [NXRA] | CL @43 | LD1 @48  
 | LD2 @58  
 A/C2:CL919EH2,2262022 |TAUR | LC2 @34 [NXRA] | LC1 @45

2883 6.04 RH VS 6.04 RL 19 -28.78 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (3000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -20.0 3700.0  
 A/C1: CL919OR,2164133 |RELZ | POTRA @44 (DFD) | DES @47 [XRA] | IDES @53  
 A/C2:CL919OR2,2264033 |RELZ | CL @46 [XRA] | ICL @48

2883 6.04A RH VS 6.04A RL 19 -28.78 CROSSING\_ENCOUNTER  
 SL = 4 ZTHR = 600.0 TAUR = 20.0 TAUU = 20.0 ALIM = 300.0  
 500.0 (3000.0,0.0) (3000.0,0.0) -0.15 -0.15 -25.0 -20.0 3700.0  
 A/C1: CL919WZ,2165144 |RELZ | POTRA @44 (DFD) | DES @47 [XRA] | IDES @53  
 A/C2:CL919YZ2,2265044 |RELZ | CL @46 [XRA] | ICL @48

Mitre encounter Class : 19

Reit number : 2883

NMAC Characterization

31% had pattern shown on attached plot  
planned separation = +/- 500, 1000 ft  
AC1 rates : 1000, 3000, 5000 fpm  
AC2 rates : 3000, 5000 fpm  
AC1 accel : (36%) -0.05, (64%) -0.15 g  
AC2 accel : (64%) -0.15, (27%) -0.25, (9%) -0.35 g  
AC2 accel time : CPA: (55%) 20, (9%) 25, (36%) 30 sec

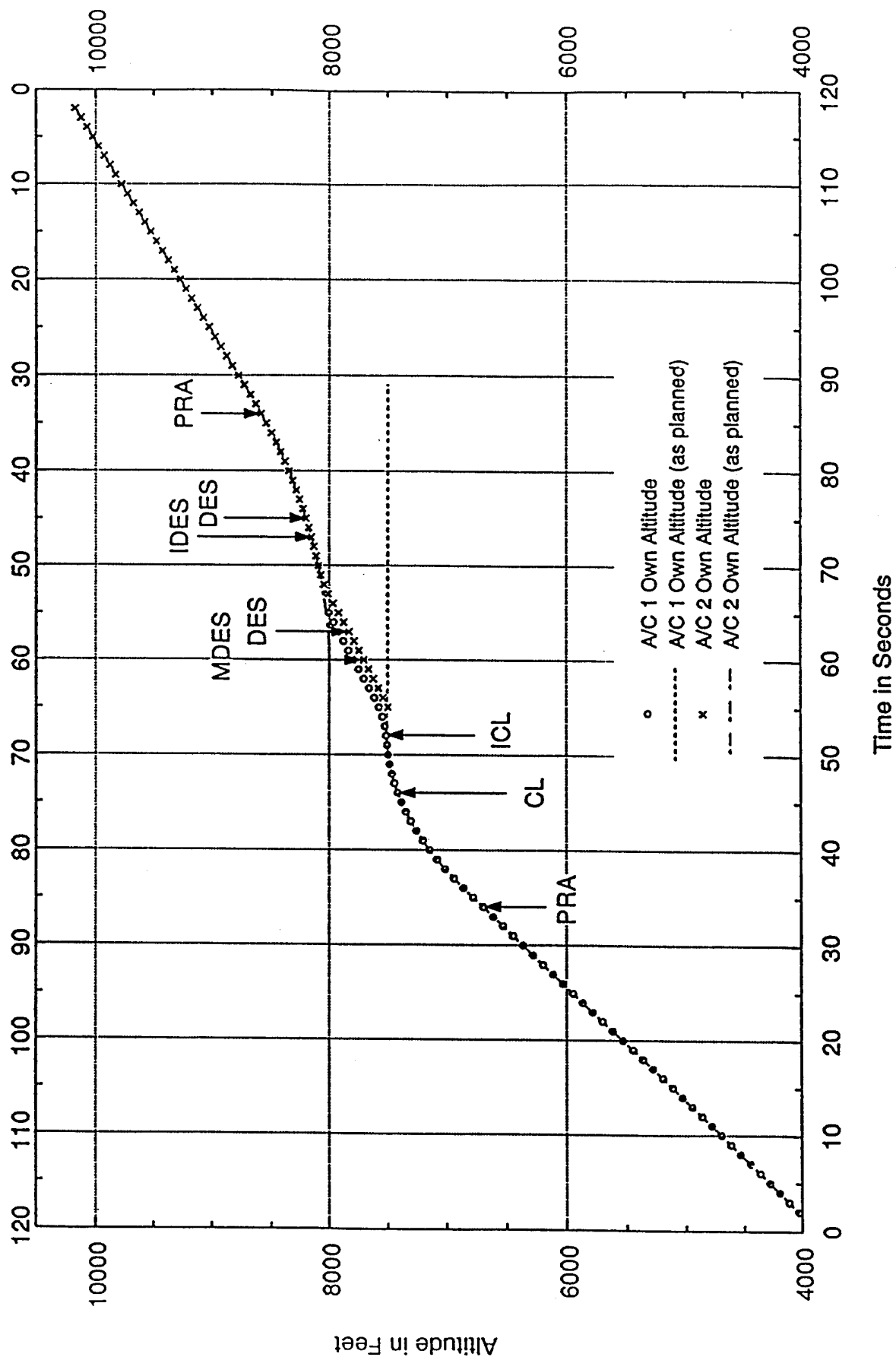
Performance Statistics (relate to whole class)

77% of RAs were non-crossing  
0% of NMACs were non-crossing

# ENCOUNTER SUMMARY - AIRCRAFT ALTITUDES

Data File Name=LL919YZH.605; REIT Number=7162

SIM MODE:2165144 (Source: LL Composite FTEG Run, Dated 07/29/94)





7162 6.02 RH VS 6.02 RL 19 242.44 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 750.0 TAUR = 25.0 TAUU = 25.0 ALIM = 400.0  
 -500.0 (5000.0,0.0) (-3000.0,0.0) -0.15 0.05 -25.0 -30.0 7500.0  
 A/C1: CL919CF,2162122 |PVMD | POTRA @41 (DFD) | CL @44 [XRA] | ICL @46  
 A/C2:CL919EH2,2262022 |PVMD | DES @43 [XRA] | IDES @47

7162 6.04 RH VS 6.04 RL 19 242.44 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (5000.0,0.0) (-3000.0,0.0) -0.15 0.05 -25.0 -30.0 7500.0  
 A/C1: CL919OR,2164133 |PVMD | POTRA @42 (DFD) | CL @44 [XRA] | ICL @46  
 A/C2:CL919OR2,2264033 |PVMD | DES @43 [XRA] | IDES @47

7162 6.04A RH VS 6.04A RL 19 88.47 CROSSING\_ENCOUNTER  
 SL = 5 ZTHR = 600.0 TAUR = 25.0 TAUU = 25.0 ALIM = 350.0  
 -500.0 (5000.0,0.0) (-3000.0,0.0) -0.15 0.05 -25.0 -30.0 7500.0  
 A/C1: CL919WZ,2165144 |TAUR | POTRA @34 (6FT) | CL @46 [XRA] | ICL @52  
 A/C2:CL919YZ2,2265044 |TAUR | POTRA @34 (6FT) | DES @45 [XRA] | IDES @47  
 | DES @57 | MDES @60

Mitre encounter Class : 19      Reit number : 7162

NMAC Characterization

69% had pattern shown on attached plot  
planned separation =      -500, -750      ft  
AC1 rates :      (3%) 1000, (76%) 3000, (21%) 5000      fpm  
AC2 rates :      (28%) -3000, (72%) -5000      fpm  
AC1 accel :      -0.05, -0.15      g  
AC2 accel :      0.05, 0.15, 0.25, 0.35      g  
AC2 accel time : CPA:      (64%) 20, (24%) 25, (12%) 30      sec

Performance Statistics (relate to whole class)

77% of RAs were non-crossing  
0% of NMACs were non-crossing

## APPENDIX M

### MINUTES OF 24 AUGUST 1994 NMAC REVIEW MEETING

#### I. Overview

A meeting was held at Lincoln Laboratory on 24 August 1994 to review the CAS version 6.04A NMACs. An attendance list is given on page 3. Agenda items included:

- (1) a review of Lincoln's 30 "representative NMACS," i.e., TCAS-TCAS simulated encounters in which both aircraft were TCAS-equipped (6.04A), both pilots responded properly, and yet the vertical separation at closest approach was less than 100 ft.
- (2) a review of FAA Technical Center's 13 failure mechanisms, i.e., the primary logic mechanisms underlying the TCAS-TCAS NMACs.
- (3) a discussion of how to develop a class of encounters that would include known TCAS "events." This would include aircraft overshooting their altitude clearances (two aircraft accelerations instead of just one).

Most of the meeting was devoted to item 1. Item 2 was also completed. Item 3 was essentially not addressed.

#### II. Agenda Item 1

For each of the 30 NMACs, we attempted to answer the following questions:

- (1) Did we understand the NMAC? What caused it? Was there anything about the logic performance that we could not explain or that seemed wrong? Were we satisfied with the trade-offs made by the logic?
- (2) How frequently did we expect this encounter to occur in the airspace? Would it occur only as a result of some breakdown or error in the system, or would it be something that controllers would do on a regular basis?
- (3) Would this encounter be affected by any of the version 7 changes? Might the problems go away with version 7?

We flagged encounters that we did not understand and encounters that could occur frequently. Encounters were considered somewhat less urgent if they would be improved by version 7. Version 7 improvements could come from the following: better tracker (faster detection of maneuvers), elimination of coordination delay (earlier posting of RA - earlier pilot response and less time for aircraft contrary motion), TCAS-TCAS reversals, and immediate posting of a crossing RA in both aircraft if a crossing RA is selected by one aircraft.

Comments on specific encounters:

Class 515, reit 1195. The question was raised about the likelihood of an aircraft going to 5000 fpm from level flight at low altitude. The group felt that high rate climb-outs from busy airports are likely. Also, these rates could occur with crossing restrictions, i.e., when an aircraft has to be above or below a set altitude by a certain distance. See action item 6.

Class 616, reit 5863. This would be a good encounter to check the effect of the 25ft tracker.

Class 717, reit 2538. (Ref CRF 176) The comment was made that with version 7 neither aircraft would issue an RA. Both aircraft would remain yellow TAs *even though both would clearly be threats*. We agreed that this needs further thought. This same idea was rejected some years ago because it essentially communicated false information (that the intruder was not a threat) to the pilot, perhaps preventing the aircraft from making some last-minute saving maneuver (a turn?).

Class 717, reit 8982. A suggestion was made to trigger the TCAS-TCAS reversal logic when TCAS detects an intruder acceleration during own's pilot response delay period.

Class 818, reit 3615. (Ref CRF 139) This will exercise the new logic that immediately issues a crossing RA in both aircraft when a crossing is issued in one aircraft. (Or it could exercise the TCAS-TCAS reversal logic.) This would be a good encounter to check the balance between early crossings for both aircraft vs. a TCAS-TCAS reversal.

Class 818, reit 4970. (Ref CRF 205) See action item 2.

Class 515, reit 4283. See action item 1.

Class 515, reit 5543. SL3 is not adequate to handle the high vertical rates we are using. See action item 6.

Class 818, reit 1520. See action item 3.

Class 818, reit 3978. Same comment as Class 818, reit 3615 above.

Class 919, reit 2883. This was compared to the Houston encounter. Concern was expressed that this could (has?) happened in the airspace. See action item 6.

Class 919, reit 7162. This is a "Seattle encounter" but with 750 or 500 ft planned separation. The comment was made that all Seattle encounters that we know of in the airspace have had 1000ft planned separation. It was agreed to include this encounter (as an overshoot) in the special encounter set. Andy Zeitlin pointed out that the overshoot is an easy extension of the level-off encounters we already have. We would just add an extra parameter to our existing classes. See action item 4.

Class 919, reit 1509. There was no concern about this encounter because the aircraft is delaying a crossing RA, waiting for a level-off to occur, and this is viewed as an appropriate trade-off.

Class 919, reit 3523. See action item 5.

Class 313, reit 1614. This could happen in the airspace. See action item 6.

### III. Agenda Item 2

FAA Technical Center reviewed the failure mechanisms observed in their simulation database. Their groupings were based on logic features, rather than on geometry (the Lincoln basis). The 13 failure mechanisms were:

1. Contrary Encounter Mechanism
2. Firmness Encounter Mechanism
- 3-7. Maintain Encounter Mechanism
- 8-11. Recovery Encounter Mechanism
12. Restart Encounter Mechanism
13. Slow Level-off Encounter Mechanism

Example plots were reviewed for each type of failure mechanism.

### IV. Action Items

(answers to be faxed to other members of review committee)

- (1) FAATC: Class 515, reit 4283. Look into why we get an increase RA when the aircraft's vertical rate is already 3000 fpm.
- (2) FAATC: Class 818, reit 4970. Explain why 6.04 and 6.04A have such different results - 6.04 gives no RAs while 6.04A gives RAs that lead to NMACS.
- (3) MITRE: Class 818, reit 1520. Look into the subject of many deferrals occurring one after another, resulting in too long a delay in issuing an RA.
- (4) MITRE: Present thoughts on an overshoot class at the next TCAS Program Review.
- (5) Lincoln Lab: Give second-by-second and summary data to Larry Nivert and MITRE for each of the three NMAC encounters in which the planned separation was 1000 ft. (all class 919, reits 1738, 4969, 5131)
- (6) Lincoln Lab: Communicate results of altimetry monitoring when available (what vertical rates and accelerations are we seeing in the airspace? what kinds of overshoots?) Check with ARINC on expected autopilot performance.
- (7) Lincoln Lab: Circulate meeting minutes to all attendees (one per organization). Give a report at the next TCAS Program Review.

### V. Attendance List

1. Larry Nivert	FAA/ARD-140	202-267-8462
2. Andrew Zeitlin	MITRE/CAASD	703-883-6858
3. Tom Choyce	FAATC/ACD-320	609-485-4658
4. Kathryn Ciaramella	FAATC/ACD-320	609-485-5254
5. Ellen Meadors	TASC	617-942-2000
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